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### Thesis

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<http://dx.doi.org/doi:10.21954/ou.ro.00012cf9>

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**Learning in Uncertainty: Examining the relationship between perceived environmental uncertainty and self-regulated learning of finance professionals, and the role of technology in supporting it**

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Master of Science – Learning and Technology

Master of Science – Geology

Thesis submitted to The Open University

for the Degree of Philosophy in Educational Technology

Funding for this thesis was provided by The Leverhulme Trust

Institute of Educational Technology (IET)

The Open University

26th September 2020



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## Abstract

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Uncertainty is an inherent component of the modern-day workplace. Professionals need to learn to navigate their work lives through these uncertainties. Thus, learning to manage continuous change and uncertainty is key to professionals carrying out their practice successfully. Although past research has sought to unpack the intricacies of uncertainty perception and management, it has been predominantly at an organisational level. Two factors remain largely unexplored in the current literature: 1) Uncertainty perception and learning at an individual level and 2) Role of technology in supporting individual learning during uncertainty. The research questions posed in this thesis, stem from an inclination to address this gap and evaluate whether empirical evidence exists for an association between perception of uncertainty and how individuals learn during periods of uncertainty, and the role of technology in mediating this association.

This thesis aims to address the following research questions through a mixed methods research design, including semi-structured interviews, questionnaires, and co-design approach with members from the Chartered Institute for Securities and Investments (CISI). What is the nature of environmental uncertainties within the finance sector and the perception of finance professionals towards these uncertainties? How do finance professionals self-regulate their learning in times of uncertainty? How do finance professionals perceive the role of technology in supporting their self-regulated learning during uncertainty? How do finance professionals perceive the usefulness of the LiU framework in recommending SRL strategies based on the type of perceived uncertainty? Three studies were planned to answer these research questions.

Study 1 focused on delineating the nature and sources of environmental uncertainties in the finance sector. Results from the thematic analysis of interviews from Study 1 ( $n = 9$ ) provided the categorisation of sources of objective uncertainty within the finance sector. It also provided insights into how finance professionals perceived the antecedents and consequences of uncertainty and what type of self-regulated learning strategies they used when faced with uncertain times. Whether their self-regulation strategies differed based on the type of uncertainty they perceived was investigated in Study 2. Study 2 investigated the relationship between self-regulated learning and perceived environmental uncertainty using quantitative survey method and secondary analysis of interview data. Statistical analysis of survey data ( $n = 39$ ) revealed that certain self-regulated learning strategies were significantly different across the types of perceived uncertainties. Among the self-regulation phases, statistically significant differences were seen in forethought and self-reflection phases; however, no significant differences were found in the performance phase based on the type of perceived uncertainty. This means that the way professionals planned their learning activities, set goals to achieve the learning objective and the extent to which they valued the learning activity depended on the type of uncertainty they perceived. Similarly, their self-reflective learning processes also differed based on the type of perceived uncertainty. However, the wide range of strategies they undertook to achieve the learning goals, their critical thinking and help-seeking abilities were the same throughout,

without a differential effect of perceived uncertainty. These results were in alignment with the thematic analysis of secondary interview data ( $n = 26$ ), where the SRL strategies were associated with the type of perceived uncertainty. Study 3 investigated the role of technology in supporting the self-regulated learning behaviour of professionals using a co-design approach with two iterative cycles (Iteration 1:  $n=10$ , Iteration 2:  $n=10$ ). Results from Study 3 showed that of the three phases of learning in uncertainty (identify-introspect-implement), any technology support was most effective in the introspection phase. It also revealed the importance of reflection as a dominant theme when learning in uncertainty.

Altogether, the original contribution of this thesis was examination of the relationship between perceived environmental uncertainty and self-regulated learning and the role of technology in supporting it. In doing so, it highlighted the importance of guiding the professionals in the regulation of their learning and the positive implications it had in terms of motivational and metacognitive aspects. It also highlighted the role of a technological scaffold in helping the professionals become more reflective in their learning and strategic in managing their uncertainty.

This thesis is dedicated to the loving memory of my dear father-in-law.

Baba - This one's for you. Thank you for always believing in me.

## Acknowledgement

---

I want to thank the Leverhulme Trust for funding my doctoral research and making it possible for me to undertake the most exhilarating journey of my life. I gratefully acknowledge everyone who supported me on this beautiful journey.

First and foremost, I want to express my deepest gratitude to my supervisors, Professor Allison Littlejohn and Dr Simon Cross for guiding me throughout the research process with patience, understanding, and encouragement at every step of the way. I am truly inspired by your immense knowledge and ability to drive intellectually stimulating conversations that led to several ‘eureka’ moments. These are the moments that I will always cherish the most. Professor Littlejohn’s passion for professional learning research and Dr Cross’s attention to detail and ability to skilfully unpack the nuances of qualitative data have shaped my perspective towards academic research. I would like to acknowledge Professor John Richardson for providing feedback on the earlier draft of the thesis.

Apart from my supervisors, I would also like to thank George Littlejohn from CISI for being an excellent industry gatekeeper and for sharing insights from the finance sector. I am also very grateful to the finance professionals who participated in this research. Thank you for your valuable time and dedication with which you contributed to the research. Without your inputs, this thesis would not have been possible.

I am grateful to the wonderfully supportive and lovely PhD community at IET. Vicky, Pin, Shi Min, Quan, Tina - Thank you for always being there. Mainly, a huge thanks to Vicky for supporting me through the writing phase. Savitri, Videhi, Priya, Radha, Shiveta – thanks for helping me keep things in perspective and for keeping me connected to the world outside academia.

Of course, this acknowledgements section would be incomplete without thanking my loving parents and my awesome brother - Kingshuk for believing in me and supporting me in all my ventures. Thank you for imbining in me a staunch belief system, that continues to be my guiding light at all times. My doting parents-in-law further strengthened this belief system, and I shall be ever so grateful to them for their constant support and understanding. I am also thankful to my dear siblings-in-law – Sowmya and Pramod Bhaiyya. Thank you for being there for me when I needed you.

I cannot thank my husband enough for his unwavering support and love, without which I would not have been able to make it to the finish line. Vinod – this achievement is just as much yours as it is mine. Thank you for being my rock throughout these four years. I couldn’t have done this without you. Also, a special thanks to my sweet daughters – Shreya and Sonia, whose unfeigned and innocent confidence that ‘Mummy is the best’, has seen me through some of the most challenging times. Thank you for being my cheerleaders and for all those motivational messages and cute drawings of tasselled graduation hats on my whiteboard every morning. They always gave me the extra boost of energy, which I very much needed.

## Declaration of Authorship

---

The empirical research carried out in this thesis consists of three studies. The first part of Study 1 (conducting interviews with finance professionals) was done in collaboration with Leonie Jacob, University of Regensburg. The collaboration was restricted to creation of interview schedule and conducting interviews. We created the interview schedule together by operationalising Milliken's framework. I added extra questions related to my research on learning in uncertainty. I also took the lead on conducting interviews, while Leonie accompanied me for most of them. While we collaborated on data collection, our research focus was entirely different. My focus was on understanding how professionals perceive uncertainty and how they learn during uncertainty, while Leonie's focus was on creating uncertainty vignettes and using them to understand innovative work behaviour in uncertainty. The vignettes created from Leonie's research were used in Study 2 – LiU survey. However, our distinct research focus and independent analysis enabled a clear distinction between our efforts and original contributions. I hereby certify that the thesis I am submitting is entirely my own work. Any other collaborations are explicitly acknowledged.

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## List of Abbreviations

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Abbreviation	Expansion
CISI	Chartered Institute for Securities and Investments
CIT	Critical Incident Technique
CoP	Communities of Practice
CPD	Continuing Professional Development
EU	Effect Uncertainty
IMF	International Monetary Fund
ITS	Intelligent Tutoring Systems
LiU	Learning in Uncertainty
MiFID	Markets in Financial Instruments Directive
MMR	Mixed Methods Research
PEU	Perceived Environmental Uncertainty
QCA	Qualitative Content Analysis
RU	Response Uncertainty
SDA	Secondary Data Analysis
SDL	Self-Directed Learning
SRL	Self-Regulated learning
SRLWQ	Self-Regulated Learning at Work Questionnaire
SU	State Uncertainty
TA	Thematic Analysis
TAM	Technology Acceptance Model
TEPL	Technology Enhanced Professional Learning
UTAUT	Unified Theory of Acceptance and Use of Technology
VT	Vignette Technique

## Chapter 1: Introduction

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### 1.1 Introduction

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Uncertainty is an inherent component of the modern-day workplace (Brown et al., 2011). It is a major area of interest within the field of management, change management, and organisational learning (Markowska & Wiklund, 2020; Bohlinger et al., 2015; Vecchiato & Roveda, 2011; Duncan, 1972; Downey & Slocum, 1975; Gifford et al., 1977). During ambiguous times, professionals need to learn to navigate their work lives through various uncertainties. Learning to manage continuous change and uncertainty is not only a critical skill expected of professionals but also an essential part of their employability. Times of uncertainty create a need for continuous learning to enable professionals to adapt to uncertain circumstances. Siemens (2005) asserts that knowledge has a best before date, and hence must be renewed to prevent it from being obsolete. Siemens (2005) notion of continuous renewal of knowledge, is echoed in the management literature in the form of organisational unlearning and relearning when faced with environmental uncertainties (Zhao & Wang, 2020). Thus, it is essential to understand how learning happens in uncertain times. The ability to learn in uncertainty can be considered from two perspectives – individual learning that shapes the individual performance (micro perspective) and organisational learning that defines organisational success (macro perspective). However, much of the existing literature tends to focus on the macro perspective of the organisations (see, e.g. Michel & Wortham, 2009; Zhao & Wang, 2020). There are a few examples that combine the micro and macro perspective. For example, Wang et al., (2019) found that individual unlearning mediated by organisational unlearning and relearning has a positive effect on strategic flexibility. This means that strategic flexibility, which is an indicator of an organisation's ability to succeed in an uncertain environment (Bock et al., 2012), depends on the professionals' ability to learn, unlearn, and relearn. Hence, there is a need to focus on unpacking the individual learning processes in uncertainty.

The uncertain nature of workplaces warrants that professionals take charge of their workplace learning activities (Billet, 2011; Fenwick, 2001) and self-regulate their learning (Fontana et al., 2015; Margaryan et al., 2009). There is a growing body of research exploring the intersection between working, learning, and uncertainty (Bohlinger et al., 2015b; Markowska & Wiklund, 2020; Schulz et al., 2017). However, there is limited focus on the professionals' perception of uncertainty. In particular, it is unclear how professionals conceptualise uncertainty in their workplace, the antecedents and consequences of the uncertainties they perceive, how they manage to learn during uncertainty, and the challenges they face in doing so. Examining these aspects are essential, as understanding how professionals perceive and learn in uncertainty have implications for their job satisfaction and personal well-being (Cullen et al., 2014; Fløvik et al., 2019; Schmidt et al., 2014). Furthermore, learning activities in uncertainty are driven by perceived objectives shaped by the perception of uncertainty (Engeström and Kerosuo, 2007). In this context, it is vital to understand professionals' perception of



uncertainty in their workplaces and how they envisage the role of learning in coping with uncertain times (Simon, 2000).

In 2016, when this research began, the financial sector was in a high state of uncertainty following the political upheavals of Brexit (Boulanger and Philippidis, 2015; Cruise et al., 2016; Moloney & Journal, 2016; Reenen, 2016). Hence the financial sector was a logical choice as a research context in which to carry out the studies. Owing to massive regulatory changes and the economic impact of restrictions on cross-border trading, sustaining and enhancing human capital through innovative professional learning in uncertainty was a priority for the sector and the country (Scarpetta & Booth, 2016). 'Finance sector' is a broad term encompassing varying domains such as wealth management, compliance and risk, operations, capital markets, corporate finance, retail banking, financial planning, and asset management. Typically, very few organisations operate in all these domains, and ones that do are globally distributed. A chartered organisation where all the finance professionals subscribed for their learning and development had the potential to provide a research space where a variety of perspectives across the sector could be understood. Hence, the Chartered Institute of Securities and Investments (CISI) - an independent body that focuses on enhancing individual professionalism in the areas of knowledge, skills, and behaviour was selected as the research site for conducting this study. It provided access to individuals who experienced a broad range of uncertainties in the finance sector. Moreover, the research objective aligned with CISI's purpose to support the development of professional learning competence in its members. Their experience in supporting professional learning activities in various finance contexts made them a strong research partner. During initial discussion regarding research access, CISI stakeholder suggested that a study on learning in uncertainty should focus on wealth management, compliance and risk, operations and IT, and retail banking, as these domains were identified as the ones being most impacted by uncertainty. Following CISI's suggestions, it was jointly agreed to focus only on these domains while recruiting research participants.

## **1.2 Defining Uncertainty**

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In the most literal sense uncertainty refers to the phenomenon of being unsure. However, the colloquiality and ubiquity of the term 'uncertainty' makes it 'too easy to assume that one knows what he or she is talking about' (Downey and Slocum, 1975, p.562). Naturally, academic literature is strewn with varying definitions, conceptualisations, and operationalisation of uncertainty.

Within the neoclassical finance literature, the distinction between uncertainty and risk was rarely made (Gigerenzer, 2018). One of the earliest attempts of defining and distinguishing uncertainty from risk was made by Knight (1921) on the basis of whether it was possible to objectively quantify and determine the probabilities through long-run frequencies. Thus, situations that allowed for objective probability distributions were defined as 'risk', while those that could not be modelled through single probability distributions were defined as 'uncertainty'. Therefore, if properly measured and planned for, Knightian risk can be easier to manage. However, as Knightian uncertainty refers to

dealing with an unknown future state, it can be difficult to plan for and manage uncertain situations. In real world though, 'it is uncertainty, not risk, which is more prevalent circumstance in economic and business environment' (Keynes, 1936). Many organisational theorists and economists have been fascinated by this ubiquitous nature of uncertainty, which led to a plethora of definitions and conceptual frameworks to be proposed from early 1970s to 1980s. Following are some of the prominent definitions of uncertainty proposed by organisation theorists during that period:

An inability to assign probabilities as to the likelihood of future events (Duncan, 1972, p.318).

A state that exists when an individual defines himself as engaging in directed behaviour based upon less than complete knowledge of – a) his existing relationship with his environment, b) the existence of knowledge of conditional, functional relationships between his behaviour and environmental variables to the occurrence of a future self-environment relation, and c) the place of future self-environment relations within the longer time frame of a self-environment relations hierarchy (Downey & Slocum, 1975, p.571).

From the objective definitions of uncertainty by Knight (1921) and Keynes (1935) to the perceptual definitions by Downey and Slocum (1975) there is a wide variation in terms of how uncertainty is defined in the extant literature. These variations are discussed in further detail in **Section 2.4**. In this thesis, uncertainty will be defined as 'an individual's perceived inability to predict something accurately', as per Milliken's (1987, p. 136) conceptualisation of uncertainty that brings together both objective and perceptual views. The operationalisation of this definition is further explained in **Section 1.6**.

### **1.3 Problematising Learning in Uncertainty**

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Most existing research on uncertainty in organisational contexts has concentrated on the impact of environmental uncertainty on organisational factors such as strategic foresight (Vecchiato & Roveda, 2011a), entrepreneurial decision-making (McKelvie et al., 2011), or innovation (Freel, 2005). In their seminal work on organisational theory and organisational learning, March & Olsen, (1975) highlighted the importance of studying learning processes from an individual perspective. However, there have been surprisingly few studies that were conducted in the field of learning in uncertainty, especially from an individual perspective. The concept of uncertainty at the time revolved around two dominant schools of thought – objective view (Miles & Snow, 1978) and perceptual view (Duncan, 1972). Milliken's (1987) framework provided a conceptual framework for researchers to synthesise the two views of uncertainty and to conceptualise objective environmental uncertainty in terms of how it is perceived differently by managers – state, response, and effect uncertainty. Milliken's (1987)

framework was instrumental in encouraging researchers to examine perceptions of uncertainty at an individual level. Although it was suitable for analysis at an individual as well as organisational level, it has mostly been used at group-level or organisation level research (McMullen & Shepherd, 2006). For example, El-Awad (2019) employed Milliken's (1987) PEU framework in their comparative case-study research on learning behaviour at the venture level. They found that prior domain related experience and uncertainty perception were the two factors that impacted learning behaviour.

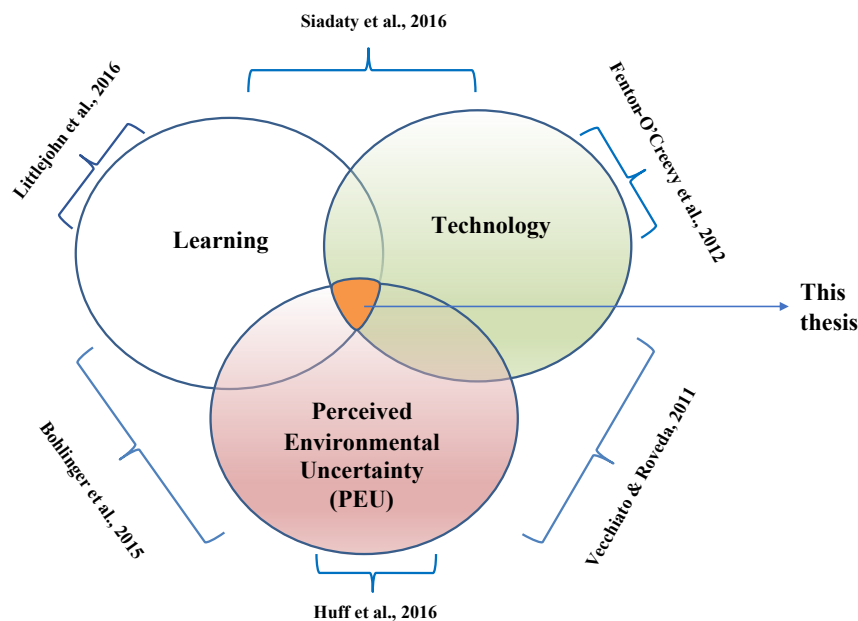
A problem that exists in fully understanding the concept of learning in uncertainty is the complexity associated with defining the objective and perceptual parameters of the environmental uncertainty. Weiss and Wittmann (2018) assert that in order to gain a holistic understanding of environmental uncertainty and the associated cognitive processes, it is essential first to establish the objective/tacit factors that define the nature of uncertainties within the research context and then to examine the perceptual factors. However, the tacit factors are context-dependent and subject to change with time (Hertati, 2015; Vanevenhoven, 2012). Hence before understanding the learning/cognitive processes of finance professionals in uncertainty, it is vital to establish the nature of environmental uncertainties within the finance sector and how the finance professionals perceive them. Thus, it was identified as the **first research objective of this study – to examine the nature of uncertainties in the finance sector.**

As discussed earlier, a holistic understanding of environmental uncertainty was a synergy between objective environmental factors (social context) and perceptual factors (individual context). Hence, to examine learning in uncertainty required a learning theory that encompasses both social and cognitive aspects of learner's environment. Self-regulated learning (SRL) theory, which has its roots in socio-cognitive theory, was therefore used to operationalise the concept of 'learning'. Such explicit theorisation of learning in uncertainty has not been undertaken in previous research. For instance, Michel & Wortham (2009) carried out a detailed qualitative investigation of professionals' cognitive processes shaped by uncertainty at the workplace. However, they did not explicitly study the learning processes concomitantly with the perception of uncertainty. Similarly, other studies that have briefly touched upon the concept of learning in uncertainty did not unpack the type or perceptions of uncertainties or define the learning theory used to conceptualise the research (Bohlinger et al., 2015; Lopes, 2010). From this, emerged a **second research objective - to examine how professionals' choice of self-regulated learning strategies relate to the type of uncertainty they perceive by making the choice of learning theory and conceptualisation of perceived uncertainty, both explicit.**

Finally, this research was conducted at CISI, where technology is used to deploy and support the continuing professional development (CPD) framework for their members. However, they do not incorporate elements of SRL support within their technology framework. Technology enhanced professional SRL has been gaining momentum (Siadaty et al., 2011; Siadaty et al., 2012a; Siadaty, et al., 2016). Within the finance sector, there are a few niche examples where technology enhanced learning interventions were developed for professional training and development purposes (Fenton-

O’Creevy et al., 2012). For example, the xDelia<sup>1</sup> project used advanced gaming technology and wearable sensors for reducing systematic bias in financial decision-making skills of professionals in the fields of professional trading, private investment, and personal finance (Fenton-O’Creevy et al., 2012). They employed a learning design approach with participatory design and evaluation framework. Thus, it can be argued that technology has been proven to be an effective approach to skills development in the finance sector. Hence, a similar approach was adopted in order to provide CISI with a set of recommendations for incorporating technology supported SRL in uncertainty. This requirement constituted the **third research objective of this thesis – to examine the perceived role of technology in supporting self-regulated learning in uncertainty of finance professionals and the fourth objective was - to examine the perceived usefulness of the recommended SRL strategies.**

**Figure 1.1** depicts that the research in this thesis lies at the intersection of learning, technology, and perceived environmental uncertainty.



**Figure 1.1: Research positioning within existing literature**

## 1.4 Contextual significance of the research

The timeliness of this study is in sync with the tremendous uncertainty in the finance sector due to the COVID-19 pandemic, a dynamic political landscape (e.g. Brexit), and rapid technological advances in the Fintech sector. Thus, continually adapting to changing workplace practices has never been more relevant to finance. There is a plethora of literature examining the impact of major political

<sup>1</sup> <http://www.xdelia.org/>.

events (Dai & Zhang, 2019; Dhingra et al., 2016; Kelly et al., 2016; Pástor & Veronesi, 2013; Reenen, 2016), technology disruption (Chen & Bellavitis, 2019, 2020), and regulatory changes (Cumming et al., 2019) on the financial sector. Since the COVID-19 outbreak, there have been several studies assessing the economic and macro-economic impact (Baldwin & Mauro, 2020; Brown, 2020; Das, 2020) in the finance sector. The majority of these studies focus on quantifiable impacts of uncertainty on national economies and global markets. However, apart from the long-lasting economic and global implications, events of uncertainty in the finance sector are also known to have sociological and psychological impacts on the professional and personal well-being of employees. For instance, in a study that set out to determine the impact of uncertainty caused by the financial crisis of 2008, Mehri (2011) found a significant dip in the professionals' overall job satisfaction in terms of security and motivation in the Iranian banking sector.

Similarly, Markovits et al. (2014) studied the impact of the economic crisis in Greece to show that the financial crisis had a negative impact on employees' job satisfaction and commitment which was related to the change in their self-regulation focus. These findings show that times of uncertainty triggers attitudinal changes in professionals which, according to Markovits et al. (2014) could be representative of 'adaptive adjustments' in response to the uncertainty. Despite the growing body of research studies qualitatively examining the finance sector, there are few studies that qualitatively examine the uncertainty construct from the professionals' perspective in terms of their work-life context (see Hetzner et al., 2009).

Also, finance is a typically knowledge-intensive sector (Windrum and Tomlinson, 1999) characterised by the constant pressure to keep up with the transformation of skills and competencies. This need for constant renewal of knowledge introduces a large amount of uncertainty into the workplaces and consequently has significant implications for professional learning activities. However, due to the dynamic nature of the sector, most of the workplace learning that happens is unstructured, unplanned, and on-the-job learning (Eraut, 2011). For example, consider the case of Lloyd's market of London - the speciality insurance and reinsurance market. In response to the COVID-19 lockdown restrictions, they had to shut down their underwriting floors for the first time in the institution's three hundred and thirty-three-year-old history. Although, the markets remained open, the trading and negotiating was moved online—the sudden transition from face-to-face to digital transactions impacted around 45,000 employees. The professionals had to train themselves to adapt their work practices in order to efficiently conduct their business online, in a short amount of time, with minimal formal training available to support them through the transition. In this example, even without formal training from Lloyds, the professionals would have been able to figure out the technical details of taking their work online, as technology has made unprecedented amounts of information available on any topic that we need to learn. However, undertaking learning during such tremendous periods of uncertainty in the workplace requires prolific self-regulation of one's learning processes.

This section has established the contextual significance of the present research. The next section explicates the research aims and research questions addressed in this thesis.

## 1.5 Research aims and objectives

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As already noted in the previous sections, to date the role of SRL during uncertainty remains mostly unexamined. Although there is a plethora of theoretical and empirical research on SRL, uncertainty, and technology supported professional SRL, the interplay between the three constructs remains to be understood. **Section 1.2** problematised the learning in uncertainty research and identified four research aims:

- to examine the perceived nature of uncertainties in the finance sector.
- to examine how professionals' choice of SRL strategies relate to the type of uncertainty they perceive.
- to examine the perceived role of technology in supporting SRL of finance professionals in times of uncertainty.
- to examine the perceived usefulness of the recommended SRL strategies.

In order to fulfil these aims, three studies were planned.

**Study 1** examined the perceived nature of uncertainties by finance professionals. Thus, it was essential to delve deep into the professionals' context of the uncertain situation and their cognitive and metacognitive thought processes that framed the perception of that situation. Since the aim of Study 1 was to explore various aspects of how uncertainty is perceived, a research approach that allowed exploration of participants' perceptions was needed. As qualitative research interview is considered a channel to discover the meaning of actions from the descriptions of experiences shared by participants (Kvale, 1996), it was deemed the most suitable approach. Semi-structured interviews were carried out with 9 finance professionals who were knowledge workers at a senior level. The detailed descriptions of the uncertainties provided by the participants were distilled into short vignettes which were used in Study 2 for contextualising uncertainty, in a questionnaire. Whether these uncertainties impacted professionals on an individual level and how they self-regulate their learning during these times was investigated in Study 2.

The first research question addressed in this thesis is:

**RQ1:** What is the nature of environmental uncertainties within the finance sector and the perception of finance professionals towards these uncertainties?

**RQ1.1** – What is the nature of uncertainties perceived by finance professionals?

**RQ1.2** – What are the antecedents and consequences of uncertainty as perceived by the finance professionals?

**RQ1.3** – In what ways do finance professionals respond to the periods of uncertainty?

**Study 2** examined the SRL behaviour of professionals during times of uncertainty. A methodological challenge encountered during the design stage of Study 2 was ensuring standardisation across the participants in terms of the uncertainty they were visualising while answering the survey questions. Vignette Technique (Mulder, 2015) was adopted as a solution to this problem. Uncertainty vignettes created in Study 1 were used in the questionnaire as a tangible trigger to induce an uncertainty perception. The professionals were asked to answer the SRL questions about the

uncertainty vignette. The questionnaire also gathered information to ascertain the type of perceived uncertainty. The responses from this survey revealed the mapping between SRL strategies and perceived uncertainty. Triangulation of results was achieved through secondary data analysis of 35 finance professionals' interviews. Based on findings from Study 1 and Study 2, a 'Learning in Uncertainty (LiU)' framework was proposed along with an approach to learning in uncertainty (i<sup>3</sup> approach). Outputs from this study were used as the basis for designing a technological intervention, which was evaluated in Study 3. The second research question was:

**RQ2:** How do finance professionals self-regulate their learning in times of uncertainty?

**RQ2.1** – Does finance professionals' choice of SRL strategies relate to the type of uncertainty they perceive?

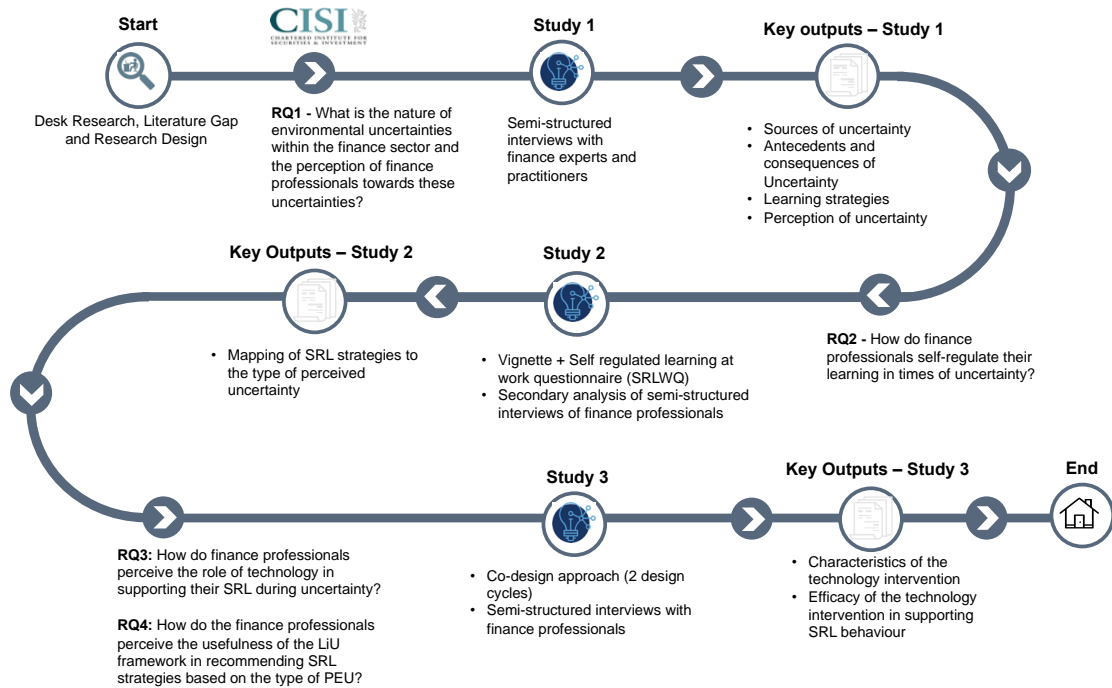
**RQ2.2** – What are the SRL strategies employed by finance professionals when they perceive uncertainty?

**Study 3** examined the role of technology in supporting SRL behaviour of professionals. A prototype technology intervention was developed using co-design approach. There were two iterations of the design cycle. In the first iteration, a low-fidelity wireframe of a mock-up mobile app was designed. Based on the feedback of professionals following the first iteration, a high-fidelity prototype in the form of a web module was developed in the second iteration. This study also examined the perceptions of professionals about using technology as learning support in uncertainty and for validation of the LiU framework. The third and fourth research questions addressed in Study 3 were:

**RQ3:** How do finance professionals perceive the role of technology in supporting their SRL during uncertainty?

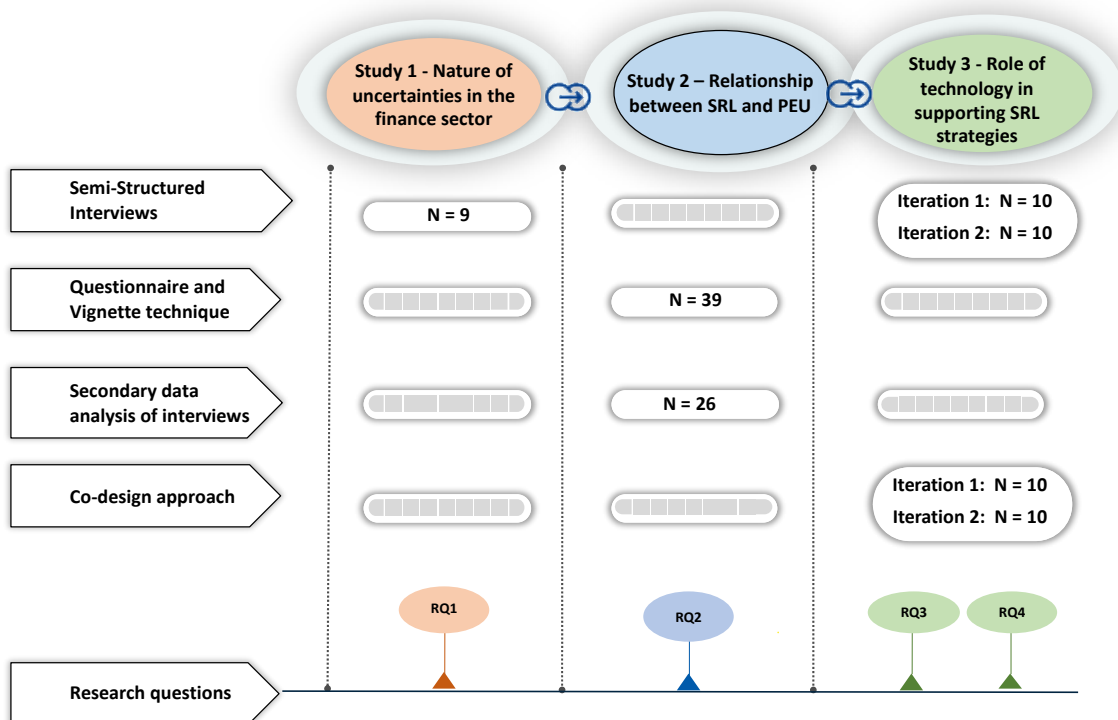
**RQ4:** How do the finance professionals perceive the usefulness of the LiU framework in recommending SRL strategies based on the type of PEU?

**Figure 1.2** illustrates how the three studies were planned along with the research questions and their key outputs.



**Figure 1.2: Research Design**

**Figure 1.3** depicts a mapping of the research questions with the studies undertaken and the research methods that were employed.



**Figure 1.3: Pictorial representation of the research questions addressed in this thesis**

The next section provides definitions of the key constructs used within this research.



## 1.6 Conceptualising and defining key constructs

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Terms such as finance professionals, uncertainty, learning, prototype recur throughout the thesis. These terms may have several different meanings depending on the context. They will be discussed in detail in the subsequent chapters (Chapter 2 – Literature Review and Chapter 3 – Research methodology). However, to avoid ambiguity from the outset, they are briefly defined below to illustrate how they will be interpreted in this thesis:

**Perceived Environmental Uncertainty (PEU):** For the context of this thesis, uncertainty is conceptualised as a perceptual phenomenon that describes 'the state of a person who perceives himself/herself to be lacking critical information about the environment' (Milliken, 1987, p. 134).

Operationalisation of this definition in order to ensure a valid measure for PEU in the empirical studies of this thesis requires an understanding of not just the source of uncertainty but also the type of uncertainty. Milliken's tripartite classification (Milliken, 1987) was employed to operationalise the definition of uncertainty and to delineate the type of uncertainty being perceived by finance professionals, as follows:

- **State Uncertainty** refers to the inability of understanding how components of the environment might change.
- **Effect Uncertainty** refers to the professionals' inability to predict what the consequences of change will be on their organisation.
- **Response Uncertainty** is the inability to formulate response options or to predict the consequences of a response choice.

These three types of uncertainties will be discussed in detail in Chapter 2 (**Section 2.4**).

**Self-Regulated Learning (SRL)** – There is a plethora of SRL theories in contemporary literature. Adapting from Zimmerman's (1989) definition of SRL, within the context of this thesis – Professionals are described as self-regulated to the degrees that they are 'metacognitively, motivationally, and behaviourally active participants in their own learning process' (p.329). Further explanation regarding which other SRL theories were considered, and why Zimmerman's definition was chosen can be found in Chapter 2 (**Section 2.6**)

**Finance Professional** – The term 'finance professionals' encompasses individuals working in a wide range of domains within the finance sector such as wealth management, compliance and risk, operations, capital markets, corporate finance, retail banking, financial planning, and asset management. As CISI was selected as the research site for conducting this study, within the context of this thesis, a finance professional means –

- Practitioner in the financial service industry
- At least an Associate Member of the CISI

**Prototype** – A prototype can be defined as an early model of an object, machine, or process designed to evaluate the underlying principles and enhance efficacy. One of the aims of this thesis is to synthesise findings into an implementable framework which in turn can be developed into a learning intervention to support SRL behaviour during uncertainty. To that end, based on the findings from Study 1 and Study 2, a technological prototype was developed and evaluated in Study 3. The technical details of actual implementation (coding) and integration with organisational learning systems is outside the scope of this thesis.

**Low Fidelity/High Fidelity prototype** – Fidelity of a prototype describes how different it is from the finished product and the degree to which it reflects the design aspects and functionality of the end product (Walker et al., 2002). Low fidelity prototype differs significantly from the finished product in terms of their design aspects and interaction functionality. However, they allow designers to present their ideas to the stakeholders, gain agreement on the implementation details and then focus on the functionality rather than visual styles. On the other hand, high fidelity prototypes provide a functional product that highly resembles the finished product. In Study 3, both low fidelity and high-fidelity prototypes were developed during the two iterations of design cycles.

## **1.6 Synopsis of the thesis**

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### **Chapter 1: Introduction**

The present chapter introduced the research rationale and set the stage for the study undertaken to fulfil the research objectives. It summarised the gaps in current literature from which four main research questions emerged. It gave an overview of the research design, research questions, and definition of key constructs used in this thesis.

### **Chapter 2: Literature Review**

The second chapter contextualises the research questions posed in this thesis and situates them within the realm of existing academic literature. Using Technology-enhanced Professional Learning (TEPL) (Littlejohn and Margaryan, 2013) as a guiding framework, this chapter synthesises the literature from three strands of research: SRL, PEU, and technology supported SRL. The goal of this literature review was to highlight the research gap addressed in this thesis, from which the research questions emerged.

### **Chapter 3: Research Methodology**

The third chapter presents the justification of choices made for research design, methodology, and selection of cases. This chapter also discusses the key ethical considerations faced during this research and how they were addressed.

#### **Chapter 4: Study 1 – Nature of Uncertainties in the finance sector**

The fourth chapter presents the methods and findings from Study 1. It provides insight into the nature of uncertainties that professionals encounter in the finance sector. It also provides insights into how they perceived the antecedents and consequences of uncertainty and what type of strategies they used when faced with uncertain times. Whether these uncertainties impacted professionals on an individual level and whether their self-regulation strategies differed based on the type of uncertainty they perceived was investigated in Study 2.

#### **Chapter 5: Study 2 – Self Regulated learning strategies during uncertainty**

The fifth chapter presents the methods and findings from Study 2 that explored the relationship between SRL strategies employed when perceiving different types of uncertainty through a mixed-methods approach.

#### **Chapter 6: Study 3 – Role of technology in supporting SRL during uncertainty**

The findings from Study 2 were used as the basis of designing a technology based scaffolding tool, where SRL strategies were recommended based on the pedagogical profile. The evaluation and efficacy of the technology prototype are discussed in the sixth and final data analysis chapter.

#### **Chapter 7: Discussion and Conclusion**

Finally, the seventh chapter serves as a logical culmination point that summarises the findings of the thesis in the context of the overarching research questions, discusses key limitations encountered in this thesis and illuminates the broader implications of the research – to practice and international scholarship in the form of theoretical and methodological contributions.

## Chapter 2: Literature Review

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### 2.1 Introduction

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This chapter aims to justify in detail the rationale behind the research questions outlined in Chapter 1. It begins by giving an overview of the research conducted in the field of learning in uncertainty (**Section 2.2**). Subsequently, it outlines the key ideas and theories related to the three pillars of this thesis – PEU (**Section 2.3**), SRL within the workplace learning context (**Sections 2.5 and 2.6**), and technology-supported SRL (**Section 2.8**). Each section begins by reviewing the existing literature, followed by identification of the gaps, and culminates into the research questions that address the gap. The theoretical frameworks selected to operationalise the concepts connected to the research questions are also presented (**Sections 2.4, 2.7, 2.9**). The final section (**Section 2.10**) summarises the discussion by using Littlejohn and Margaryan's (2013) 'Technology-enhanced professional learning' (TEPL) framework, as a conceptual scaffold to synthesise the research from three different strands of literature meaningfully.

### 2.2 Learning in Uncertainty

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Uncertainty is a critical aspect of workplace environment that individuals need to navigate their professional lives through (Ashill & Jobber, 2010; Duncan, 1972; Milliken, 1987). Uncertainty can be defined as, "an individual's perceived inability to predict something accurately" (Milliken, 1987, p.136). The concepts frequently studied in the context of uncertainty are organisational learning (macro-perspective) ((Hu et al., 2016; Michel & Wortham, 2009)) and decision-making (meso and micro perspective) (Fenton-O'Creevy et al., 2011; Mann, 2011; Petratou, 2016; Regan, 2012; Vecchiato & Roveda, 2011). The concept of learning in uncertainty was first introduced by March and Olsen (1975), in which they drew upon the seminal work of March and Simon (1958) on organisational theory to study how organisations learn in uncertainty. They noted that the classical theories of rationality in organisational theory did not sufficiently reflect the 'learning' process involved in organisational decision-making. Although their study specifically focused on the organisational learning perspective, they acknowledged the importance of studying the learning processes from individual perspective. They noted that,

...individuals in organizations modify their understanding in a way that is intendedly adaptive even though faced with ambiguity about what happened, why it happened, and whether it is good. To develop a theory of learning under such conditions, we probably require ideas about information exposure, memory, and retrieval; learning incentives; belief structures; and the micro development of belief in organizations. (March & Olsen, 1975, p.147).

It has been over four decades since March and Olsen's (1975) call for understanding and theorising the concept of learning in uncertainty. Yet, much work remains to be done in terms of understanding the cognitive and sociocognitive processes that shape individual learning under uncertain conditions. Still, one thing that has been established is that learning in uncertainty is different from learning in regular (routine) situations. Simon (1991) argued that even though learning in normal times is limited by bounded rationality<sup>2</sup>, it is more so in times of uncertainty because of “range of what is certain is diminished, relevant experience is lacking, heuristics are not available or provide faulty guidance, and search processes are even more incomplete” (Moynihan, 2008, p.350). The prevalence of ambiguity and significance of learning in uncertainty is a recurring theme acknowledged in literature (Cullen et al., 2014; Pollard, 2001; Schmidt et al., 2014; Teboul, 1999).

For example, Michel and Wortham's (2009) book titled ‘Bullish on uncertainty’ is an excellent example of a detailed comparative qualitative investigation of individual psychological and cognitive processes shaped by the organisational culture in two investment banks. Although they did not rely on any uncertainty framework, their longitudinal research design and detailed description of the uncertainties faced by the individual bankers, helps situate their findings and arguments in the broader context of uncertainty literature. They carried out a two-year-long study in two banks, which they refer to as the 'Individual Bank' and 'Organisational Bank'. The Individual bank followed the standard principles of organisational theory (March & Simon, 1958) and sought to reduce uncertainty for their bankers. Conversely, the Organisation bank deliberately amplified uncertainty for their bankers by placing them in projects outside their expertise and experience levels. Based on data collected from 250 interviews, 7000 hours of participant and non-participant observation, and document analysis they found that the bankers who were exposed to high uncertainty situations learnt how to succeed in ever changing environments. Their findings show that Organisation bankers ‘consistently adjusted to unanticipated market changes more successfully’ (Michel & Wortham, 2009, p.5), whereas Individual bankers who were shielded from uncertainty transitioned from 'insecure high-achievers' to identity centred content experts, who were less capable of performing in high uncertainty situations. Their findings show the significance of organisational culture on how professionals learn in uncertainty. Though this study collected data from individuals, the focus was on organisational learning and organisational culture. Hence it falls under the macro or meso perspective.

While less well researched than the macro and meso level, some studies have begun to unpack learning in uncertainty at the individual level. For example, Lopes (2010) set out to investigate the decision-making process in uncertainty using complexity theory. However, during the first few interviews, they noticed a recurring theme that all the respondents' experiences of dealing with uncertainty “seemed to be embedded in a learning experience that upholds a learning concept under

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<sup>2</sup> Bounded Rationality – The theory of bounded rationality was proposed by Herbert Simon as an alternative theory to neoclassical economics, in which he proposes that decision-making agents are limited in their ability to retrieve, store, and process information. In the absence of sufficient information, they choose ‘good enough’ or ‘satisficing’ solutions to their problems from the available response choices based on their past experiences.

uncertainty” (p.246). Hence, they decided to discard the previous hypothesis, and instead adopted a grounded theory methodology to explore the theme of ‘learning in uncertainty’. The conceptual framework proposed by Lopes (2010) based on the empirical findings show that two axes drive the central concept of uncertainty – one is the ‘tacit’ or objective characteristics of an uncertain context, while other is the one associated with the learner’s “cognitive, communicative and social capacities, which have an impact on him as a human being” (p. 253).

Bohlinger et al. (2015), brought together research on adult education and professional learning in the light of globalisation and uncertainty. They examined the global developments in working and learning in uncertainty at the micro (individuals), meso(organisational), and macro (socio-political) levels. Apart from the high-level classification of levels of uncertainty, the authors failed to provide a clear demarcation or unpacking of the ‘uncertainty’ construct in relation to workplace learning literature.

Using system theory as a theoretical lens, Akpolat et al. (2013) conducted an in-depth literature review of learning and innovation in uncertain times. They found that despite a plethora of research on PEU, “its potential to explain issues of learning and innovation in complex and dynamic times has not yet been fulfilled” (p.217). They urged researchers to look at PEU as drivers of new learning and innovation within organisations even though they acknowledge that:

...positive relationship between perceived environmental uncertainty and learning and innovation can be difficult to establish, yet we believe there is a high degree of interdependency between these concepts and that there are benefits in further exploring the link between perceived environmental uncertainty and organisational learning and innovation. (Akpolat et al., 2013, p.217)

These studies indicate the value in investigating further the concept of learning in uncertainty, particularly from the individual perspective using well-established theories from the learning sciences. The subsequent sections present key theories and studies in the fields of uncertainty, workplace learning, and the role of technology in workplace learning and elucidates how these concepts are conceptualised and operationalised in this thesis.

## **2.3 Nature of uncertainties in the finance sector**

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Within the finance sector lack of surety could relate to a myriad of geopolitical, economic, or environmental factors. We are currently living through a time of uncertainty induced by the devastating global pandemic. Since the COVID-19 outbreak, there have been a number of studies assessing the economic and macro-economic impact of the various environmental uncertainties brought about by the pandemic (Baldwin & Mauro, 2020; P. Brown, 2020; Das, 2020). For instance, Barro et al. (2020) applied the 1918-1920 Spanish flu epidemic to estimate a range on the economic

impact. Based on a 2% infection rate, they estimated 3-6% decreases in GDP. McKibbin & Fernando, (2020) did a fairly thorough examination of the impact of seven different pandemic scenarios on the macroeconomics, predicting a highly uncertain future for the global markets. Their analysis revealed that even a contained outbreak for a short period of time could cost the global economy and financial markets significantly. These studies clearly indicate that the financial sector is headed for unprecedented levels of uncertainty, as they face the dual challenge to maintain credit flow in the midst of declining development while managing elevated risk and uncertainty (Barua, 2020).

Besides the current crisis, there is a large volume of published studies investigating the impact of major political events (Dai & Zhang, 2019; Dhingra et al., 2016; B. Kelly et al., 2016; Pástor & Veronesi, 2013; Reenen, 2016), technology disruption (Chen & Bellavitis, 2019, 2020), regulatory changes (Cumming et al., 2019) on the financial sector. However, what these studies examine are the visible and quantifiable impacts of uncertainty on the finance system.

Moreover the economic and global implications of uncertainty events in the finance sector are also known to have long lasting sociological and psychological impacts on the professional and personal well-being of employees. For instance, Chang et al., (2013) carried out time trend analysis of suicide data from fifty-four countries to find that there were 4884 excess suicides in 2009, as compared to previous years, which were attributable to the global financial crisis of 2008. Slightly less tragic, but equally consequential ramification was observed on the employees' professional well-being. For example, in a study that set out to determine the impact of uncertainty caused by financial crisis of 2008, Mehri (2011) found a significant dip in the professionals' overall job satisfaction in terms of security and motivation in the Iranian banking sector. Similarly, Markovits et al. (2014) studied the impact on economic crisis in Greece to show that the financial crisis had a negative impact on employees' job satisfaction, commitment, and self-regulation. These findings depict the tremendous uncertainty under which finance professionals navigate their work-life through, with additional pressure of causing far reaching social and economic impact. Hence it is especially important to understand the underlying antecedents and consequences of these uncertainties, and how finance professionals learn from it to enhance their daily work practices.

## **2.4 Defining PEU**

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The concept of uncertainty is central to many organisational theories (Miles & Snow, 1961; Thompson, 1967; Lawrence & Lorsch, 1967). Early conceptualisations of workplace uncertainty go back to pioneering management scholars March and Simon (1958). They argued that the inherent instability of the workplace environment creates uncertainty for professionals, thus limiting their ability to fully gather, process, and make sense of the information about continually changing events. This kind of uncertainty, where employees lacked accurate information about organisations, activities, and events in their external environment, or were not confident in predicting the major changes, was defined as 'environmental uncertainty' (Duncan, 1972).

In subsequent decades, environmental uncertainty has emerged as an essential variable that impacts strategic foresight (Vecchiato & Roveda, 2010, 2011b), entrepreneurial action (McKelvie et al., 2011), organisational goals (Bourgeois, 1985), innovation (Freel, 2005), decision-making (Dia, 2011), organisational learning mechanisms (Ellis and Shpielberg, 2003), competitor identification and organisational performance (Yu et al., 2016). A plethora of research has been undertaken to identify the various organisational factors contributing to environmental uncertainty. **Table 2.1** presents some critical empirical research undertaken to identify the environmental factors as sources of uncertainty.

**Table 2.1: Overview of research on environmental factors as sources of uncertainty and methods used**

<b>Researchers</b>	<b>Method used to identify the factors</b>	<b>Environmental factors impacting PEU</b>
<b>Dill (1958)</b>	Interviews with management personnel	Task environment – factors directly relating to the organisational setting General environment – Factors indirectly influencing the organisation
<b>Lawrence and Lorsch (1967)</b>	Through executive interviews	Market Scientific Technical
<b>Duncan (1972)</b>	Semi-structured interviews with executives from diverse functional units.	<b>Internal Environment:</b> Personnel, Functional Organisation level factors <b>External Environment:</b> Suppliers Customers Competitors Socio-political Technological <b>Environmental dimensions:</b> Simple-complex Static-dynamic
<b>Milliken (1987)</b>	Conceptual framework – empirically investigated later by (Gerloff et al., 1991) using Critical Incident technique along with survey questionnaire and (Ashill and Jobber, 2010) using exploratory interviews, followed by survey questionnaire.	State uncertainty Effect uncertainty Response uncertainty
<b>Miles and Snow (1978)</b>	Conceptual framework – empirically investigated by (Shortell and Zajac, 1990) using questionnaire on strategic planning and interviews with 140 individual professionals from finance,	Suppliers Customers Competitors Labour unions Regulatory agencies Financial markets



	marketing, human resources, and strategic planning.	
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One of the first attempts at creating a typology of environmental uncertainty was made by Dill (1958). He classified them into two types – task environment (factors that directly impact the organisation) and general environment (factors indirectly impacting the organisation). Lawrence and Lorsch (1967) built upon the work of Dill (1958) and identified three significant factors within the task environment related to the market changes, scientific findings, and technical factors. Their research was followed by Duncan's (1972) seminal work, in which he argued for a perceptual view of environmental uncertainty as opposed to an objective view, which was a norm in the literature then. Based on their findings from 19 semi-structured interviews, Duncan (1972) found three factors from the internal organisation environment (personnel, function, and organisation level factors) and five external factors (suppliers, customers, competitors, socio-political, technological). They also specified two distinct dimensions of the environment – simple- complex and static dynamic.

The term PEU was coined by Duncan (1972) to denote the external and internal factors perceived by the managers, which influenced their decision-making processes. Milliken (1987) built upon Duncan's (1972) perceptual view of environmental uncertainty. In an attempt to synthesise the objective (Miles & Snow, 1978) and perceptual (Duncan, 1972) schools of thought about environmental uncertainty, Milliken (1987) proposed a theoretical framework to operationalise PEU. They proposed that there are three ways in which executives can perceive uncertainty – state uncertainty, response uncertainty, and effect uncertainty (see **Section 2.4** for more details). Since then, most of the empirical studies on environmental uncertainty have focused on the perceptual nature of environmental uncertainty (Jahanshahi, 2016; Sund, 2015; Weiss & Wittmann, 2018).

Although Milliken's (1987) PEU framework was widely adopted in organisation literature, except for Gerloff et al. (1991) there was no attempt made to create psychometric tests to investigate the three constructs of PEU empirically. Ashill and Jobber (2010) acknowledged this gap based on a comprehensive review of the literature on environmental uncertainty. They identified three major issues related to the measurement of environmental uncertainty: First, the diversity of approaches required for measuring the objective and perceptual measures of environmental factors. Second, inconsistent measures of PEU construct that challenged the convergent and discriminant validity of the PEU scale. Third, was the varied nature of environmental factors found in the perceptual studies. Ashill and Jobber (2010) addressed the second gap by psychometrically testing and validating Milliken's (1987) PEU scale. Their findings indicate that state, effect, and response uncertainties are “conceptually distinct although empirically related” (Ashill & Jobber 2010, p. 1298). They made several recommendations for future researchers. They suggested that Milliken's (1989) constructs could be used for researching antecedents and consequences of state, effect, and research uncertainty and to investigate how individual differences in cognitive processes and behavioural characteristics introduce variation into how uncertainties are perceived. Understanding the antecedents and consequences are important as they will condition someone into how they behave in an uncertainty

situation and also dictate how they respond to the uncertainty. They specifically call out the benefit of Milliken's constructs in the financial markets, as they believe that, “future real options research may benefit from measuring not only state uncertainty but also effect and response uncertainty to gain a complete understanding of how environmental uncertainty affects strategic investment” (Ashill & Jobber, 2010, p.1298).

Review of the current literature highlights another issue with the research on environmental uncertainty. Despite Milliken's (1987) attempt to bridge the gap between objective environmental factors and PEU, there is much that needs to be understood in terms of cognitive processes that are deployed to perceive the objective environmental conditions (Doty et al., 2006; Lueg & Borisov, 2014). These are further complicated by individual cognitive capabilities, personal attitudes, and the context in which the perception process happens (Weiss & Wittmann, 2018). These perceptions have been shown to be important in wider studies of agency and behaviour in the workplace (Eteläpelto et al., 2013). Weiss and Wittmann (2018) attempted to address that gap by presenting a conceptual framework of the cognitive model that guides the perception of environmental uncertainty. They argue that,

In order to create more accurate reflections of objective environmental conditions, being aware of the factors that influence the individual perception and controlling them – if possible – may have a strong impact on the quality of managerial decisions and the response repertoire as a reaction to environmental change. (Weiss & Wittmann, 2018, p.27)

However, there was no empirical evidence to support the role of cognitive processes and specifically the learning processes in the perception of environmental uncertainty. Also, to gain a holistic understanding of environmental uncertainty, it is essential first to establish the objective/tacit factors that define the nature of uncertainties within the research context. Secondly, it is to examine the perceptual factors such as individual attitudes, cognitive processes, and behavioural traits that shape the perception of that uncertainty. As Milliken (1987) puts it –

While specifying the source of uncertainty identifies the domain of the environment which the decision maker is uncertain about (e.g., competitors or suppliers), specifying the type of uncertainty focuses on delineating the nature of the uncertainty being experienced. (Milliken, 1987, p. 136)

However, objective environmental measures are subject to change with time and context (Hertati, 2015; Vanevenhoven, 2012). There is a growing body of research analysing the differential impact of sources of uncertainty in the management literature (Gaba & Terlaak, 2013; Weber & Mayer, 2014). Despite the increasing recognition of the importance of multidimensional sources and nature of uncertainty, there is a paucity of research deconstructing the sources of uncertainty in the finance sector and further examining it in the context of learning. Hence before understanding the

learning/cognitive processes of finance professionals in uncertainty, it is essential to establish the nature and sources of uncertainties within the finance sector and how the finance professionals perceive them in terms of antecedents and consequences. This brings us to the first research question of this thesis:

**RQ1:** What is the nature of environmental uncertainties within the finance sector and the perception of finance professionals towards these uncertainties?

**RQ1.1** – What is the nature of uncertainties perceived by finance professionals?

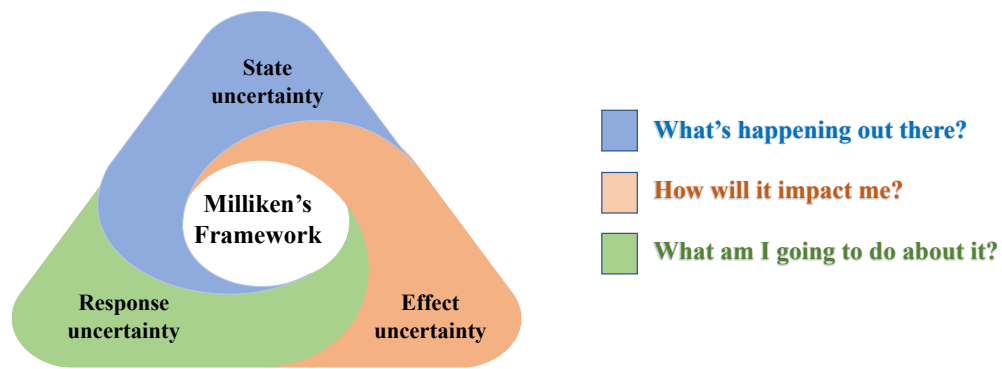
**RQ1.2** – What are the antecedents and consequences of uncertainty as perceived by the finance professionals?

**RQ1.3** – In what ways do finance professionals respond to the periods of uncertainty?

## **2.5 Theoretical framework underpinning RQ1**

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Since Milliken's (1987) framework is most extensively used in PEU research, it was chosen as the theoretical framework to operationalise the 'uncertainty' construct of 'Learning in uncertainty'. Milliken (1987) noted that research on the construct of environmental uncertainty had yielded inconsistent and often difficult to interpret results. They attributed these inconsistencies to the failure of researchers to distinguish and measure the differences in types of uncertainties. As noted in **Section 2.3**, the concept of environmental uncertainty has evolved around two fundamentally differing theoretical schools of thought. The objective school believes that uncertainty can be objectively characterised by environmental factors that cause the uncertain situations (see Miles & Snow, 1978), whereas the perceptual school implies that uncertainty mainly depends on the perception of an individual and hence a subjective property (Duncan, 1972; Milliken, 1987). For example – Gifford et al. (1977) proposed that any individual's experience of uncertainty can be attributed to her perception of lack of sufficient information or the inability to differentiate between the validity of the available information. However, in a large body of literature, the term uncertainty is operationalised in terms of the external environmental factors as being the source of uncertainty (Downey & Slocum, 1975). With a view of converging these two fundamentally differing views on uncertainty, Milliken (1987) proposed a tri-partite classification to determine the overall uncertainty faced by strategic decision makers – state uncertainty, effect uncertainty, and response uncertainty (**Figure 2.1**). McMullen and Shepherd (2006) assert that Milliken's (1987) categorisation can be operationalised by simply asking these three questions for the type of uncertainty: "What is happening out there", for state uncertainty, "How will it impact me", effect uncertainty, and "What am I going to do about it", for response uncertainty (McMullen and Shepherd (2006), p. 135).



**Figure 2.1: Milliken's uncertainty framework (adapted from McMullen and Shepherd, 2006)**

State uncertainty refers to the inability of understanding how components of the environment might change. Since this type of uncertainty is related to the volatility, complexity, and heterogeneity of the environment, its perception will depend on the nature of workplace context. For example, in the finance sector – during the introduction of a new set of banking regulations, investment bankers may perceive a higher degree of state uncertainty than asset managers. Effect uncertainty refers to the professionals' inability to predict what the consequences of change will be on their organisation. Therefore, continuing the earlier banking regulations example, effect uncertainty may be perceived about how such a regulatory introduction will impact trading and investment patterns. Finally, response uncertainty is the inability to formulate response options or to predict the consequences of a response choice. For instance, in the finance sector response uncertainty may occur if the professionals feel unsure about how to respond should the new regulations be launched. As is evident, each of these three types of uncertainties might have a different impact on the workplace learning strategies of professionals. For example, McKelvie et al. (2011) used Milliken's (1987) framework to operationalise uncertainty as a multi-dimensional construct composed of state, effect, and response uncertainty, to unpack implications of uncertainty perception on entrepreneurial action. They found differential impacts of perceived uncertainty types on, “alternative preferences for uncertainty reduction strategies, learning strategies, or profit maximization approaches” (p.275). Thus Milliken's (1987) categorisation of PEU was deemed to be a useful framework for operationalising the perception of uncertainty in the workplace in this thesis. The following section discusses the theoretical lenses through which workplace learning under uncertainty can be best examined.

## **2.6 Workplace Learning**

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In recent years, the idea of learning in the workplace has gained momentum. Especially the concepts of ‘workplace learning’ and ‘work-based learning’ were popularised during the 1990s in the form of vocational training or personnel development (Illeris, 2003). This development that started with the rise of industrialisation and capitalism during the nineteenth century has gradually evolved to

incorporate the demands of post-modernity (Bauman, 1992, Giddens, 1990), globalisation (Bauman, 1998), fast capitalism (Gee et al., 1996), and technological advances (Appadurai, 1996).

The importance of workplace learning lies in the duality of its purpose – 1) for achieving organisational goals through organisational learning or networked learning, and 2) realising personal developmental goals through individual learning (Billet, 2011; Billett, 2001a; Sfard, 2010; Tynjälä, 2008). These are intricately interdependent, as the learning culture of the organisation can impact how individuals learn at work. Organisations that provide an environment conducive to collaboration and sharing of professional best practices through development of learning organisations and learning networks, will ameliorate individual learning opportunities at work. In such an environment, learning is not limited to be a discrete activity afforded to select few individuals but becomes a part of the everyday work practices. This is how organisational knowledge becomes embedded in learning networks, procedures, and equipment (Säljö, 2004). Individuals make use of culturally accumulated knowledge that has become embedded in artefacts and organisational learning networks. The culturally influenced workplace learning of individuals is made clearer in Sfard's (1998) two metaphors for learning – acquisition metaphor and participation metaphor. The acquisition metaphor conceptualises knowledge as an external entity to be 'acquired' through formal education or training. The participation metaphor builds upon the constructivist view of knowledge – where knowledge is not something to be acquired but something that is constructed through participation in social communities. Paavola et al., (2004) proposed a third metaphor - knowledge creation metaphor by synthesising Nonaka and Takeuchi's (1995) model of knowledge creation, Scardamalia and Bereiter's (2006) model of knowledge building and Engeström's (2001) model of expansive learning. The knowledge creation metaphor emphasises "creation of something new in the process of learning" (Paavola et al., 2004, p.572). Tynjälä (2008) claims that acquisition metaphor is more suitable to understand learning in formal education settings, while the participation and knowledge creation metaphor better portray the complexities and messy nature of workplace learning contexts. Yet, recognising the 'inherently pedagogical' (Tynjälä, 2008, p.150) nature of some workplace, they proposed that formal training is needed for theoretical and practical knowledge while coaching and mentoring for socio-cognitive and self-regulative knowledge. Thus, in the workplace context, learning happens at two levels – 1) knowledge acquisition at individual level and 2) through participation and knowledge creation at individual and organisational level. Deployment of cognitive resources during task engagement and interactions (Billett, 2001) brings about cognitive change as per both individual and social perspectives. Both are important from the perspective of understanding workplace learning culture.

Billett's (2020) research on informal nature of workplace emphasises the importance of experience and reflective thought, but also has roots in sociocultural theories of learning. He argues for a balance between a social view of learning with an individual view which shapes how professionals engage with learning opportunities at work. Billett (2001a) proposed that learning in the workplace is not restricted to formal training, but it lies in the 'everyday experiences' (Billett, 2001a, p.6). They argue that workplace learning happens through opportunities afforded by the workplace

environments for contributing and experiencing the ‘practices’, rather than being formally taught about them. However, merely experiencing and contributing to the work tasks will not translate into learning. It requires ‘appropriate guidance and support’ for nurturing individual learning. Workplace factors such as power relations and inherent biases may hinder an individual's opportunities for access to sufficient guidance required to further their learning (Billett, 2001a). It is important to recognise and address these factors in order to create a workplace environment conducive to learning. Closely related to Billett’s (2001) view on workplace learning is Eraut's (2004) research on informal learning in the workplace. Based on the empirical findings of their research on mid-career workers (Eraut et al., 2000) and early career workers, they found that informal learning activities contributed about 70%-90% of the learning at the workplace even though it was recognised as an ‘occasional by-product’ (Eraut, 2011, p.12).

Historically, the knowledge required for occupations was derived from cultural practices (Scribner, 1985) which was available to individuals through active engagement and negotiation with the social world. Consequently, individuals’ deployment of this knowledge led to the reformation of cultural practices. This iterative process is broken down during times of uncertainty as professionals need to prepare themselves for the unknown, thus creating cognitive dissonance where their work-related mental models, thoughts and beliefs are inconsistent with organisational uncertain reality (Dechawatanapaisa & Siengthai, 2006). Fostering their learning practices and supporting the professionals through such ambiguous times is an essential goal for any organisation. However, it can be argued that compared to the structured certainty of formal education curriculum, workplace learning is often messy, unstructured, and informal in nature (Littlejohn et al., 2014; Milligan et al., 2014; Billett 2020); hence in effect surrounded continuously by uncertainty.

## 2.7 Learning Theories Considered

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Theoretical discussions of workplace learning practices are predominantly focused on the ideas of communities of practice (Boud & Middleton, 2003; Huzzard, 2004; Lave, 1991), self-directed learning (Fournier, 2010; Garrison, 1997; Waard, 2016), SRL (Littlejohn et al., 2016; Siadaty et al., 2011; Tynjälä, 2008; Yen et al., 2016; Zimmerman and Schunk, 2011) or activity systems (Engestrom, 2000). These discussions are underpinned by a myriad of theoretical lenses – such as cognitive theorising (Anderson, 1982), participatory learning activities (Billett, 2001b; Rogoff, 1990), or constructivist theories (Nyikos & Hashimoto, 1997). Several learning theories were considered as a theoretical scaffold to conceptualise the ‘learning’ construct. The selection criteria for the theories were that 1) it should have been used in empirical studies in the workplace learning context; 2) the findings based on these theories should be published in peer-reviewed journals. **Table 2.2** gives a summary of the learning theories considered and their respective strengths and weaknesses in the context of the research questions addressed in this thesis.

**Table 2.2: Learning theories considered for conceptualising the ‘learning’ construct**

<b>Learning Theory</b>	<b>How is learning defined?</b>	<b>What is the focus of the learning theory?</b>	<b>Limitations (in context of the thesis)</b>
<b>Communities of Practice (CoP) (Wenger, 1998)</b>	Process of acquiring knowledgeable skills through member in COP	<ul style="list-style-type: none"> <li>- Extensively used in the organisational learning and management literature to understand knowledge transfer processes.</li> <li>- Brings together the concepts of learning, meaning, identity, participation (Wegner, 1998) which are central to workplace learning</li> </ul>	<ul style="list-style-type: none"> <li>- Focuses on social interactive dimensions of CoP</li> <li>- The boundaries defining ‘community’ are not clearly demarcated.</li> <li>- Perception of uncertainty is a highly individualised construct.</li> </ul>
<b>Activity Theory (Engestrom, 2000)</b>	A cultural- historical theory that considers entire work or activity systems	<ul style="list-style-type: none"> <li>- It brings together the individual and social aspects of a system through the mediating artefact, thus giving a wholistic view of the system.</li> </ul>	<ul style="list-style-type: none"> <li>- Activity systems are driven by communal motives</li> <li>- Difficult to articulate for individual participants</li> <li>- It is not really a learning theory</li> </ul>
<b>Self-Directed Learning (SDL) (Knowles, 1975)</b>	A process in which individuals take the initiative with or without the help of others	<ul style="list-style-type: none"> <li>- Mostly used in adult learning literature to denote the everyday learning that is part of the adult life, outside the formal learning context</li> <li>- Strong emphasis on learner agency</li> </ul>	<ul style="list-style-type: none"> <li>- Intersection between learning, technology, and uncertainty is unexplored area</li> <li>- Needed to use a theory that allows for comparison, and situating this research in existing literature</li> </ul>

			- SDL is not used in the learning in uncertainty field so far.
<b>Self-Regulated Learning Theory (Zimmerman, 2000)</b>	Professionals can be described as self-regulated when they are metacognitively, motivationally, and behaviourally active participants in their own learning process	<ul style="list-style-type: none"> <li>- From socio-cognitive perspective – SRL is situation specific. Hence it can account for the variation in self-regulatory competence depending on type of uncertainty.</li> <li>- It emphasises the importance of individual agency, which is of utmost importance during times of uncertainty.</li> <li>- As, SRL has been used as a theoretical framework in similar settings (Milligan, 2015), it provides a comparative benefit.</li> </ul>	- Professionals find it difficult to set realistic and measurable goals, which is the central tenet of SRL theory.



As outlined in **Table 2.2**, four theories were considered – activity theory (Engestrom, 2000), communities of practice (Wenger, 1998), self-directed learning , and SRL. The following criteria guided the choice of learning theory for operationalising the workplace learning concept in this thesis – 1) A theory that encompasses both cognitive and social learning perspectives; 2) A theory that has been used in previous research within the finance sector.

Wenger's (1998) Community of practice (CoP) learning theory has been extensively used in workplace learning literature, to understand the collective learning of members of a domain that leads to change in practice. However, since the focus of this thesis was on individual learning, CoP was not a suitable for operationalising the concept of 'learning' for this research due to its fundamentally social nature of learning.

Closely related to CoP is Engestrom's (2000) cultural historical activity theory that conceptualises the relationship between activity, tools and artefacts required for the activity, actors within the system, and the contextual factors within which the activity is carried out in the form of an activity system that is bounded by rules and division of labour. The central tenet of the activity theory accounts for the complexity in the activity system. Hence it would have been relevant for unpacking the complexities of learning in uncertain times. However, similar to CoP, activity theory is driven by a 'deeply communal motive" (p.964). This research needed a theory that includes both individual and organisational perspective.

Self-directed learning (SDL) is 'collaborative constructivist' (Garrison, 1997, p.19) learner centric theory that has been highly researched within the adult education literature. SDL was proposed by Knowles (1975) as a "basic human competence – the ability to learn on one's own" (p.17). Hence it has been extensively used in professional informal learning contexts (Garrison, 1997). However, it has not been used in the context of learning in uncertainty. Thus, using it as the underpinning theory in this research could have contributed to the growing SDL literature. Yet, learning in uncertainty is a relatively unexplored domain (**see Section 2.2**), hence it was decided to consider a learning theory that has already been used previously in the context of finance sector.

SRL theory has its genesis in the socio-cognitive philosophy. Unlike SDL, SRL was proposed and researched mainly in the context of formal education (Azevedo and Cromley, 2004; Baumert et al., 1999; Pintrich, 2004; Winne, 1995; Zimmerman et al., 1996). However, recently there have been an increased uptake of SRL within the professional and informal learning contexts (Dalsgaard et al., 2019; Fontana et al., 2015; Littlejohn et al., 2009; Littlejohn, et al., 2016; Margaryan et al., 2009; Persico et al., 2015). Littlejohn et al., (2016) and Milligan et al., (2015) used SRL theory to explore how finance professionals learn at work. Hence, of the four learning theories considered, SRL theory was chosen as the theoretical framework for operationalising the 'learning' part of learning in uncertainty. The following section further explicates the fundamental tenets of SRL and why it was suitable as the underpinning theory for this research.

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### 2.7.1 Self - regulated learning (SRL) theory

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As explained in the previous section, SRL theory was the deemed most appropriate for the research carried out in this thesis. SRL refers to strategic and metacognitive behaviour, motivation, and cognition aimed toward a goal. Zimmerman (1989) claims that a learner “can be described as self-regulated to the degree that they are metacognitively, motivationally, and behaviourally active participants in their own learning process” (p.329). Pintrich (2000) proposed four underlying assumptions that can be identified in the SRL theories. First is that a learner is an active participant in shaping their learning activities. The second assumption is that learners undertake purposeful learning activities. The third general assumption made by SRL theories is that all learners have the ability to self-regulate their learning that is only limited by certain environmental variables. Lastly, the final assumption made by SRL models is that SRL has a positive impact on learning outcomes.

The term ‘self-regulated learning’ emerged mainly from a socio-cognitive perspective (Bandura, 1991). In socio-cognitive models of SRL, social context is central in framing and influencing individual self-regulation. The underlying goal is to enhance the individual's regulation of cognition, metacognition, behaviour, and motivation. Social and self are viewed as distinct entities whereby social influences shape the development of SRL by defining conditions for tasks and providing standards, feedback, and modelling. Also, from a socio-cognitive perspective, SRL is situation-specific. As a result, individuals can vary dramatically in their self-regulatory competence and strategies from task to task and domain to domain. Similar to Billett's (2001a) pedagogy of workplace learning (discussed in **section 2.6**), Schunk (2001) and Zimmerman (2000) emphasised the importance of social context and instruction in providing (a) modelling, (b) opportunities for guided practice, and (c) instrumental feedback. These social processes promote competence within the task, content, and context, thereby creating self-regulated learners.

Academic literature shows that self-regulation is an essential component of workplace learning for professionals, as they regulate their learning for achieving work goals (Sitzmann & Ely, 2011), for changing (Van Eekelen et al., 2005) or improving (Margaryan et al., 2009) work practices. Moreover, self-regulation amongst professionals was found to be a predictor of professional learning success (Schulz & Roßnagel, 2010). Siadat et al. (2011) emphasised the importance of the synchronicity between organisational and individual goals and expectations for learner developmental activities to benefit the organisation's performance. This assertion further strengthens the accepted notion of a symbiotic relationship between organisation and individual development and performance. Since learner's sense of agency (Biesta & Tedder, 2007) and self-efficacy (Markowska & Wiklund, 2020) are some of the reliable drivers of motivation for learning, knowing that their activities are being beneficial to the organisation could provide the intrinsic motivation for pursuing development activities during uncertain times. The process of understanding the self-regulation patterns of individuals in the professional learning context is much explored (Milligan et al., 2014; Milligan et al., 2015; Siadat et al., 2011; Siadat et al., 2012; Siadat 2012), albeit complex. Assessing these SRL processes during uncertain times further adds to the complexity, due to the challenges surrounding the

measurement of uncertainty (discussed in **section 2.4**). The following section gives an overview of the various SRL models reviewed.

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### 2.7.2 SRL Models

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Panadero (2017) conducted a meta-analysis of empirical studies on SRL models within contemporary literature and identified six models of SRL with “substantial theoretical and empirical background” (p.2). **Table 2.3** presents a summary of the six SRL models reviewed by Panadero (2017).

**Table 2.3: Comparing key SRL models with respect to their aspects of learning, SRL phases, and measuring instruments**

SRL Model	Aspects of learning	SRL Phases	Measurement instrument
Boekaerts	Cognitive, Affective, Emotion regulation, Motivation	Six components: 1) Domain-specific knowledge and skills 2) Cognitive strategies 3) Cognitive self-regulatory strategies 4) motivational beliefs 5) Motivation strategies 6) Motivational self-regulatory strategies	Online motivation questionnaire (OMQ) (Boekaerts, 1999)
Efklides	Metacognitive Motivation, Affective	Person level (macro level): 1) Cognition 2) Motivation 3) Self-concept 4) Affect 5) Volition 6) Metacognitive knowledge 7) Metacognitive skills  Task x Person level (micro level): 1) Cognition 2) Metacognition 3) Affect	Metacognitive experiences questionnaire (Efklides, 2002)

		4) Regulation of affect and effort	
Hadwin, Jarvela and Miller	Collaborative learning	Three modes of self-regulation: 1) Self-regulation 2) Co-regulation 3) Shared regulation	No instruments developed yet
Pintrich	Cognitive, Metacognitive Motivational, Behavioural, Affective	Four phases: 1) Forethought, planning, and activation 2) Monitoring 3) Control 4) Reaction and reflection	Motivated Strategies for Learning questionnaire (MSLQ) (Paul R Pintrich et al., 1993)
Winne and Hadwin	Metacognitive	Four linked phases: 1) Task definition 2) Goal setting and planning 3) Enacting study tactics and strategies 4) Metacognitively adapting studying	No measurement instruments. They explore the use of trace data for measuring SRL (Winne et al., 2011; Zhou and Winne, 2012)
Zimmerman	Socio-cognitive, Motivation	Three cyclical phases: 1) Forethought 2) Performance 3) Self Reflection	SRL interview schedule (SRLIS) ( Zimmerman and Martinez-Pons, 1988)  Academic self-regulation scale (A-SRL) (Magno, 2011)

Each of the SRL models in **Table 2.3** was evaluated for their relevance to the research questions of the thesis. As the social aspect of learning plays a pertinent role in workplace learning settings, it warranted an underpinning SRL model that included the social perspective. Based on the comparison of the SRL models, it can be seen that except for Zimmerman (2000) and Hadwin et al. (2011), none of the other models incorporated the social angle in SRL. Hadwin et al. (2011) is a relatively new model, and it does not have any validated instruments. Zimmerman's (2000) cyclical phase model is extensively used in empirical studies (as seen in **Table 2.4**).

**Table 2.4: Number of citations of SRL models for their main publication (adapted from Panadero (2017) where they gave the number of citations in 2017)**

<b>SRL Model</b>	<b>Publication</b>	<b>Total Citations (as of 1<sup>st</sup> September 2020)</b>
<b>Boekaerts</b>	Boekaerts and Corno, 2005	1708
<b>Efklides</b>	Efklides, 2011	635
<b>Hadwin, Jarvela and Miller</b>	Hadwin et al., 2011	786
<b>Pintrich</b>	Pintrich, 2000	5530
<b>Winne and Hadwin</b>	Winne and Hadwin, 1998	176
<b>Zimmerman</b>	Zimmerman, 2000	7093

Moreover, Zimmerman’s model has also been used in earlier research in the finance sector. For example, Fontana et al., (2015) constructed the Self-Regulated Learning at Work Questionnaire (SRLWQ) based on Zimmerman’s model for measuring SRL in workplace setting. They validated the SRLWQ with survey data from 170 finance professionals. Based on exploratory factor analysis, they found the following phases and sub-processes (**Table 2.5**):

**Table 2.5: Phases and sub-processes from Fontana et al. (2015) study**

<b>SRL – Forethought</b>	<b>SRL – Performance</b>	<b>SRL – Self-reflection</b>
Goal setting	Task Strategies	Self-evaluation
Strategic Planning	Elaboration	Self-satisfaction
Self-Efficacy	Critical Thinking	
Task Interest/Value		

Building on Fontana et al.'s (2015) work, Milligan et al. (2015) carried out exploratory factor analysis for investigating how self-regulatory learning behaviours can predict workplace learning within the finance sector. They found three key SRL strategies mediating the relationship between workplace affordances and learning undertaken: task interest/value, task strategies, and self-evaluation. The results from Milligan et al.'s (2015) study provided a useful starting point for this thesis, as it showed the dominance of SRL behaviour within finance professionals. Littlejohn et al., (2016) extended Milligan et al.'s (2015) findings by qualitatively examining the three key SRL strategies to define the characteristics of “good self-regulation” (p.207) for finance professionals. They found that the key characteristics of highly self-regulated learners was their perception of learning as a life-long activity undertaken for self-improvement.

Hence, Zimmerman’s cyclical model provided a well-established and robust framework tested in a variety of workplace settings that had the requirements of investigating individuals and their social influences (Hetzner et al., 2011; Margaryan, 2020; Siadaty et al., 2008; Siadaty et al., 2016).

More specifically, it has been used to research learning in a finance context (Littlejohn et al., 2016; Milligan et al., 2015). This aided placing the results in the wider literature.

Since previous research had already established the SRL strategies typically employed by finance professionals (Fontana et al., 2015; Littlejohn et al., 2016), this thesis aimed to study the SRL processes in the light of PEU, and whether the type of PEU impacts it. This brings us to the second research question of this thesis:

**RQ2:** How do finance professionals self-regulate their learning in times of uncertainty?

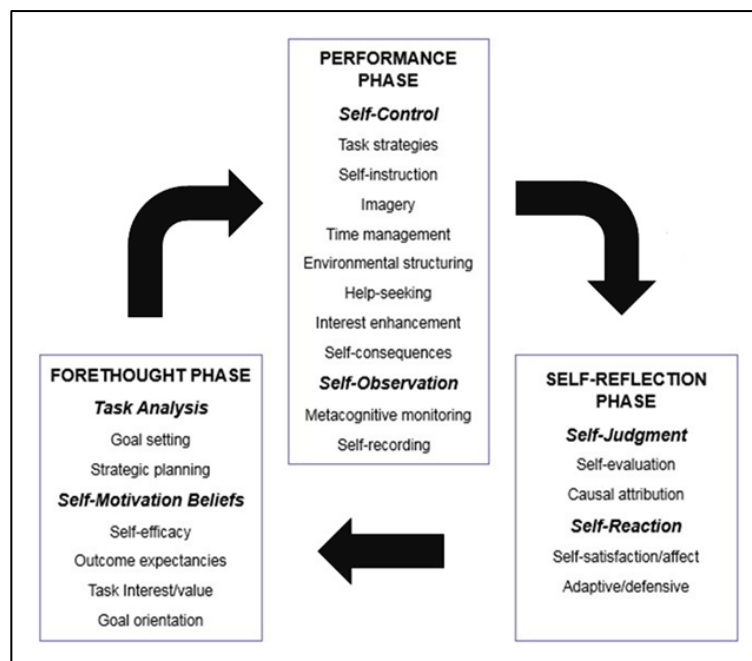
**RQ2.1** – Does finance professionals' choice of SRL strategies relate to the type of uncertainty they perceive?

**RQ2.2** – What are the SRL strategies employed by finance professionals when they perceive uncertainty?

## 2.8 Theoretical framework underpinning RQ2

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Zimmerman's (2000) cyclical phase model (**Figure 2.2**) draws from Albert Bandura's socio-cognitive theory. It consists of three cyclical phases – Forethought, Performance, and Self-reflection. Forethought phases relate to the analysis of the task, goal setting, and planning. Performance phase corresponds to the execution of the task, while the learner practices self-control and self-monitoring strategies to keep themselves focused and motivated to finish the task. After finishing the task, learners practice self-reflection to assess their performance and keep a record of success or failure of the task.



**Figure 2.2: Zimmerman's (2000) cyclical model (from Zimmerman, 2002)**

Although Zimmerman's (2000) model was initially used in formal educational settings, it is extensively used in workplace learning and informal learning contexts (Cuyvers et al., 2020). The social cognitivist approach of Bandura (1991) that is embedded in Zimmerman's (2000) framework entails a directed interaction between person, behaviour, and environment (Dinsmore et al., 2008). Alexander et al. (2011) argued that there is always a contextual character to SRL and that the contextual forces shape the strategies undertaken to regulate one's learning. Thus, it can be argued that the perception of environmental uncertainty (**Section 2.4**) can be a significant contextual force that shapes the SRL behaviour of professionals, which is the relationship that will be explored as part of the second research question.

Cuyvers et al., (2020) concluded, based on their in-depth review of self-regulation of professional learning in the workplace that, "there is no doubt that in contemporary workplaces, technology offers great opportunities to support SRpL<sup>3</sup>" (p.301). They further go on to suggest that, "use of technology should take the role of co-regulating professional learning, thereby offering transitional and flexible support rather than externally regulating learning processes and potentially making SRpL context and/or technology-dependent" (p.301).

This section defined the workplace learning context and did a brief review of the workplace learning theories before arriving at the second research question of this thesis. Then it explained why Zimmerman's (2000) three-phase cyclical framework was selected as the underpinning theory for operationalising the learning undertaken by professionals when perceiving uncertainty. Following section reviews, the key literature and trends in technology supported SRL within the workplace context.

## **2.9 Technology supported SRL in workplace learning context**

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The role of technology in supporting SRL in the workplace context has gained momentum in the last decade from state of the art trace-based measurements of SRL processes (Siadaty, Gašević, et al., 2016) to computer-supported reflective practices (Renner et al., 2020a). There are two ways in which technology is used in the SRL studies: 1) for measuring SRL and 2) for supporting/enhancing SRL (Azevedo et al., 2015). Studies that employed technology for measuring SRL did so under two categories – online and offline measurements (Schraw, 2010). The online methods of SRL measurement include think-aloud protocols (Azevedo et al., 2005; Greene et al., 2017), trace data methods (Siadaty et al., 2016; Winne et al., 2006), and eye-tracking (Zhou et al., 2010). The offline methods include the use of self-report questionnaires (Fontana et al., 2015).

Bell (2017) introduced a conceptual framework for classifying the strategies that support self-regulation in the workplace. They classified the SRL supporting strategies into three broad categories, namely a) prompting strategies; b) guiding strategies; c) cultivating strategies. Adapting Bell's (2017)

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<sup>3</sup> SRpL – Self Regulated Professional Learning. This acronym was first used by (Cuyvers et al., 2020) in their literature review of self-regulation of professional learning in the workplace.

framework, the three categories in the context of identifying the role of technology interventions in supporting or enhancing SRL could be:

### **Prompting interventions –**

These kinds of interventions typically used questions to encourage SRL activities. For example, Sitzmann et al. (2009) studied the effect of prompting interventions in declarative and procedural knowledge and whether this effect differed in immediate and delayed conditions. They found that prompting interventions had a positive effect on the declarative and procedural knowledge as compared to those who were not prompted to self-regulate. They also found that prompting interventions showed higher performance gains in learners who had higher self-efficacy.

### **Guiding interventions-**

These interventions were typically designed to enhance learners' self-regulation activities by providing information they need to make effective decisions to improve the quality and focus of self-regulation activities. For example, Sitzmann and Johnson (2012) developed an intervention in which trainees were guided through a process of planning when, where, and how much time they were going to devote to training before each module of an online course. They found that the planning intervention improved learning and reduced attrition, but only when trainees followed through on their plans or when the intervention was paired with prompts that targeted self-regulatory processes that occur after planning (e.g., monitoring, concentration). These examples show that prompting and guiding interventions are more suited to a formal training environment. Hence there are not many examples within the workplace learning context.

### **Cultivating interventions –**

These interventions aim to develop individuals' capacity to engage in SRL. As compared to the prompting and guiding interventions, cultivating interventions are likely to be more efficient in the workplace learning context where learning is largely unstructured, informal, and on-the-job (Sitzmann and Ely, 2011). Siadaty et al., (2012b) developed a web-based tool called 'Learn-B', using a design-based research approach. Their intervention mainly focused on strengthening the competencies in planning, monitoring, and reflection processes. The evaluation of the intervention showed that professionals' perceived usefulness was generally high for planning and reflection phases. However, they did not perceive the social context of the intervention to be useful. Siadaty et al. (2012b) call for further research to explore how technology interventions can be used in different contexts to cultivate SRL behaviour.

The research in this thesis answers Siadaty et al.'s, (2012b) call to investigate the role of technology intervention in supporting SRL strategies in the uncertainty context within the finance sector. As a first step, it was essential to understand how finance professionals would perceive a technology intervention and in case they reported high perceived usefulness, then what type of



intervention (prompting/guiding/cultivating) would be more useful for supporting them in their SRL processes. This brings us to the next research questions addressed in this thesis:

**RQ3:** How do finance professionals perceive the role of technology in supporting their SRL during uncertainty?

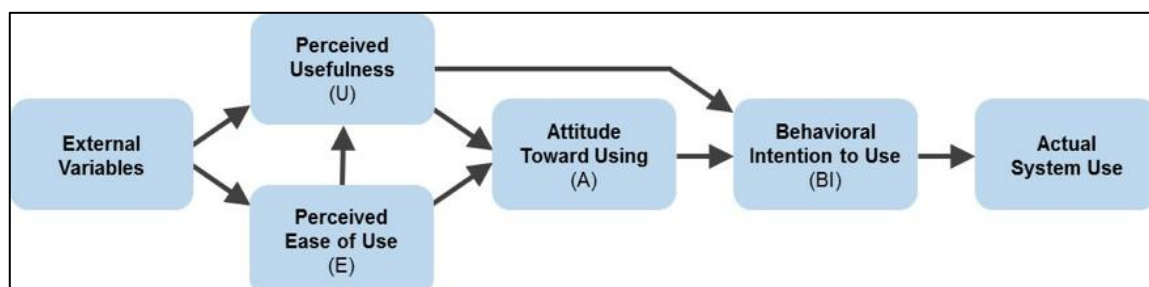
**RQ4:** How do finance professionals perceive the usefulness of the LiU framework in recommending SRL strategies based on the type of PEU?

Answering these research questions serves a dual purpose. Firstly, it is to create an implementable framework and make recommendations to practice in terms of how technology interventions can be designed and implemented such that they will be useful for professionals. Secondly, is to advance academic scholarship by capturing the perceptions of professionals in using technological interventions for supporting their SRL in workplaces. The following section explains the theoretical framework used for capturing the professionals' perception of technology supported SRL.

## 2.10 Theoretical framework underpinning RQ3 and RQ4

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The technology acceptance model (TAM) was proposed by Davis (1989) for predicting the user's acceptance of any technology system. Fred Davis hypothesised that two factors determine whether a user will accept or reject technology. The first one is how easy to use the technology is perceived to be. For example – whether a user perceives it to be intuitive and do they think that complex training will be required before they can start using the technology. The second factor is how useful one perceives a technology tool to be, which means whether the user believes that a piece of technology will make their work easier. Together these two factors can significantly predict how likely learners are to accept a technology intervention. Furthermore, based on findings from regression analysis ( $n = 112$ ), Davis (1989) found that the perceived usefulness was a more powerful predictor of usage of technology than the perceived ease of use. This finding shows that users will be more accepting of a technology system if they believe that it is useful for them as opposed to their perception that it is easy to use.



**Figure 2.3: Technology Acceptance Model (Davis, 1989)**

TAM has been extensively used in empirical research across various disciplines and contexts. There have been several variations of TAM such as TAM2 (Venkatesh and Davis, 2000) and Unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003), since its inception in 1989. Despite the modified versions and their widespread use in literature, TAM has been criticised for being parsimonious and simplistic (Bagozzi, 2007). Bagozzi (2007) critiqued the research undertaken about TAM as 'broadening' but not 'deepening' (p.244) the understanding of the technology acceptance behaviour. They called for a paradigm shift in the way technology acceptance is researched and to include the cognitive processes such as self-regulation and emotions and social and cultural aspects. Since then, researchers have been trying to extend the breadth and depth of TAM (Charnkit, 2010; Holden & Rada, 2011; Hornbæk & Hertzum, 2017).

Siadaty et al., (2016) used TAM in the workplace learning context to investigate perceived usefulness of the technological scaffolding interventions, how they were associated with micro-level SRL processes, and the extent to which they could foster engagement in SRL processes. They specifically employed the 'perceived usefulness' variable from TAM model to evaluate the perception of learners. They assert that perceived usefulness can be an 'effective proxy of metacognitive knowledge of a learning tool' and that it can "indicate the extent to which learners believe that using a learning tool can be beneficial for their learning" (Siadaty et al., 2016, p.1009). They discovered that users found interventions that provide information about organisational context to be more useful as compared to interventions that provided usage information. Users also reported high usefulness for goal recommendation intervention for supporting their planning process.

A recent example is an empirical study conducted by Wang and Zhang (2019). They used Zimmerman's (2000) SRL framework in conjunction with Davis's (1989) TAM model to examine adult learners' SRL in using technology effectively. The unique characteristic of this study was the way SRL and TAM frameworks were inter-twined to give an in-depth understanding of adult SRL behaviour. They found that openness to experience, risk propensity, technical support, and equipment accessibility were the external variables that influence the forethought SRL phase, which in turn has a positive relationship with perceived usefulness and perceived ease of use and influenced one's attitude towards technology usage. They extend the TAM model with their findings that the attitude of technology usage has a positive impact on learner performance and self-reflection.

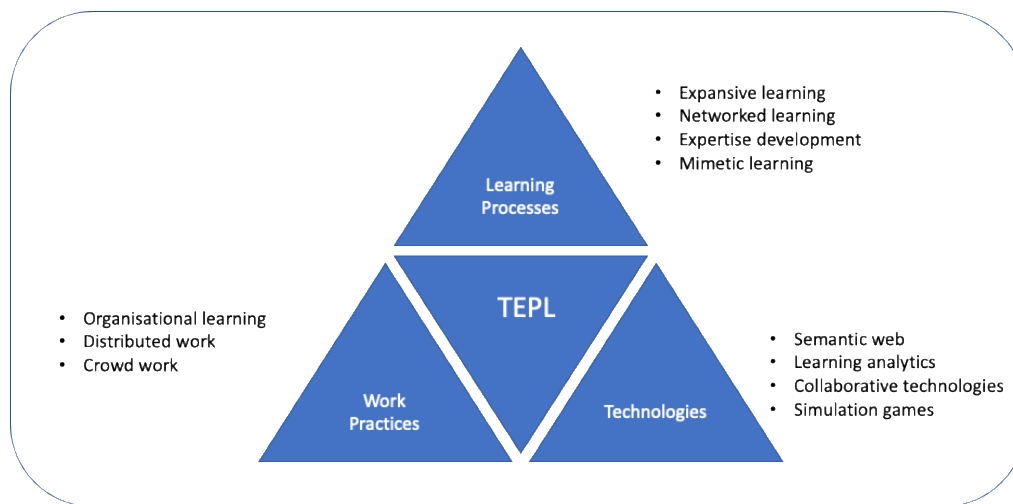
TAM was chosen as the underpinning theoretical model to address RQ3 and RQ4, as its affordances of examining perceived usefulness, perceived ease of use, and attitude towards technology usage lends itself to the research questions.

## **2.11 Conceptual framework – Synthesising the three key pillars**

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There is a general agreement in the academic world that a meaningful literature review must be more than an elaborate annotated bibliography (Webster and Watson, 2002). However, there are two distinct schools of thought about what precisely the purpose of a literature review in a doctoral thesis should be. Boote and Beile (2005) argue that literature review of a PhD thesis should aim to

situate the study in the broader context of contemporary literature, justify decisions around the scope of the study, and critically examine the claims in the literature. They emphasise that a dissertation literature review should be “thorough and comprehensive” (ibid, p.4). In contrast, Maxwell (2006) urges doctoral students to emphasise on relevance instead of being exhaustive. He advocates the idea of using a conceptual framework for “examining, assessing, and connecting published research” (Maxwell, 2006, p.30). This systems metaphor seemed well suited for this thesis, as it draws from three expansive areas of literature (Learning, Uncertainty, and Technology). Hence it required a supporting conceptual framework to meaningfully synthesise the studies from three different strands of literature.



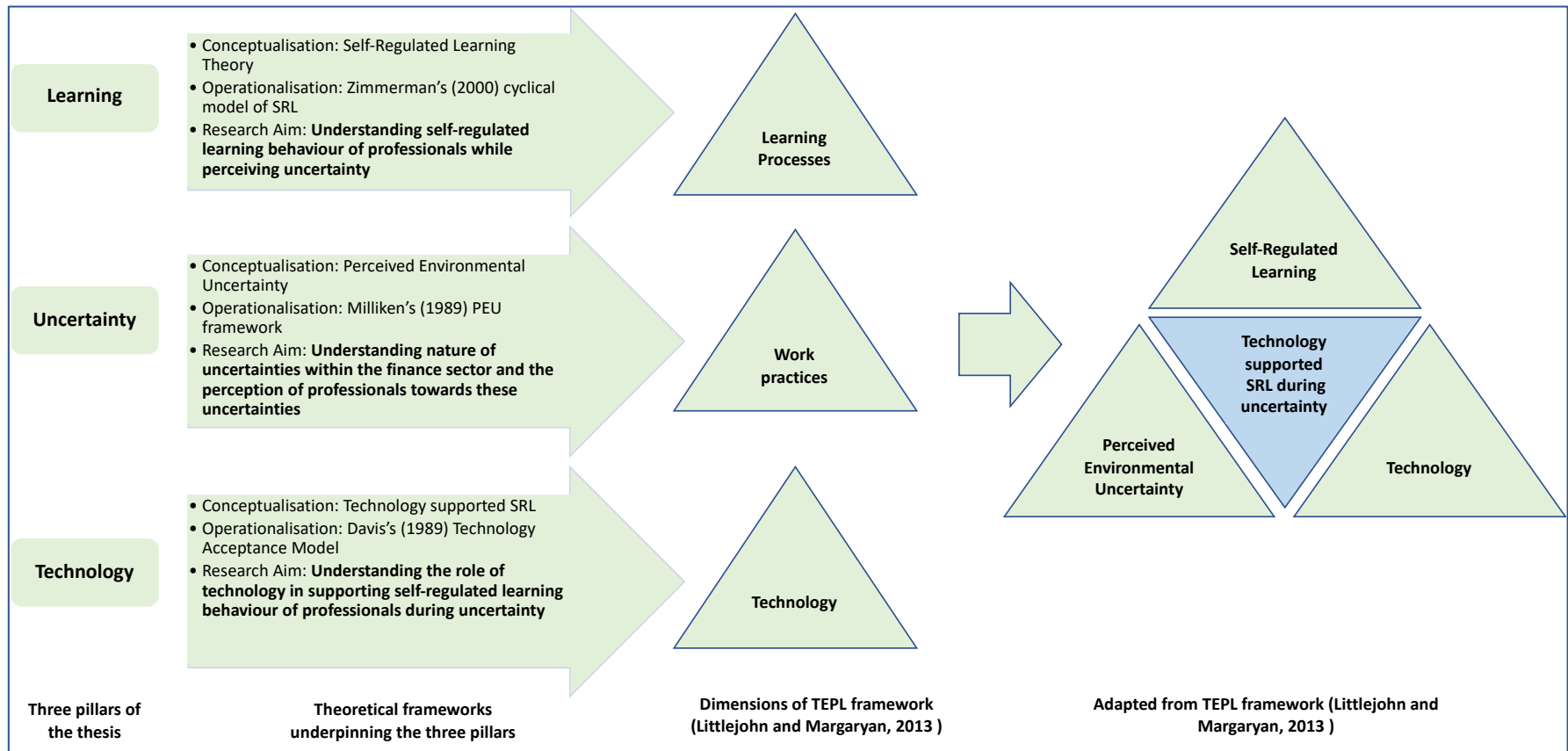
**Figure 2.4: Technology Enhanced Professional Learning ( from Littlejohn and Margaryan, 2013, p.3)**

The Technology Enhanced Professional Learning (TEPL) framework (**Figure 2.4**) proposed by Littlejohn and Margaryan (2013) was deemed a perfect fit for scaffolding the literature review of this thesis. Littlejohn and Margaryan (2013) proposed the TEPL framework in their book by the same name, to address the lack of research happening at the intersection of professional learning, workplace practices and technology evolution. Despite the recent technological advances in the professional learning area, it is counterintuitive that the research on professional learning has a limited focus on the impact of technology or that technology-enhanced learning research does not sufficiently understand how professionals learn. Similarly, both these areas of literature rarely consider the intricacies of work practices that shape professional learning. The TEPL framework provides a platform to integrate these three critical dimensions of work practices, learning processes, and technology.

Review of the literature shows that PEU is a significant factor that shapes the work practices of professionals in terms of foresight, decision-making, and performance (Vecchiato and Roveda, 2010; Vecchiato and Roveda, 2011; Freel, 2005; Dia, 2011). However, there is limited knowledge about the role of cognitive processes in the perception of environmental uncertainty. Although it is recognised in the literature that technology plays a significant role in supporting the self-regulated professional learning (Cuyvers et al., 2020), there have been limited attempts to study the role of

technology from the individual perspective. The TEPL framework identifies an area of intersection of these three fields and calls for researchers to extend the understanding of technology-supported SRL during uncertainty.

**Figure 2.5** presents a summary of how the three pillars of this thesis are conceptualised and operationalised.



**Figure 2.5: Summarising the conceptualisation and operationalisation of key concepts in the thesis**

## 2.12 Summary

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This chapter situated the research in this thesis in the extant literature by combining different but interrelated concepts of PEU, SRL, and technology supported SRL. The empirical research undertaken in this thesis uses, and in some cases, extends these concepts. This chapter began by giving an overview of the state of current research in the 'learning in uncertainty' field. It was clearly in the infancy stage and needed further studies to explore the concept of learning in uncertainty. After having discussed the need for undertaking this research, the next three sections described the three key pillars of this thesis – PEU, SRL, and technology-supported SRL in terms of how they are conceptualised and operationalised. The final section synthesises the literature reviewed for the three pillars using the TEPL framework (Littlejohn and Margaryan, 2013).

The review of literature in this chapter helped identify the four research questions. The theoretical underpinnings of the research questions are also discussed. Three major themes emerged from this chapter: 1) Modern workplace in the financial sector is subject to uncertainty through various socio-political, economic, and technological factors. 2) The learning demands of such dynamic work practices cannot be fulfilled merely by formal training sessions. 3) Technology plays a significant role in supporting this learning. Despite the role of organisations in enabling learning opportunities for employees so that they can learn and update their knowledge continually, the inherent uncertainty associated with the modern workplace necessitates professionals to self-regulate their learning. The next chapter explicates the methods used to explore the nature of these uncertainties and how professionals perceive them.

## Chapter 3: Research Design and Methodology

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### 3.1 Introduction

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Chapters 1 and 2 established the rationale behind undertaking this research and situated the theoretical perspective of PEU, SRL, and technology within the realm of workplace learning literature. This chapter explains the philosophical assumptions underpinning the research and how previously discussed theoretical concepts were operationalised into a research design and research methods. As outlined in Chapter 2, the research questions that will be addressed in this thesis are:

**RQ1:** What is the nature of environmental uncertainties within the finance sector and the perception of finance professionals towards these uncertainties?

**RQ2:** How do finance professionals self-regulate their learning in times of uncertainty?

**RQ3:** How do finance professionals perceive the role of technology in supporting their self-regulated learning during uncertainty?

**RQ4:** How do the finance professionals perceive the usefulness of the LiU framework in recommending SRL strategies based on the type of PEU?

The chapter commences with a discussion about the philosophical assumptions in terms of epistemological and ontological views. It also elaborates the methodological choices, which were influenced by the paradigmatic viewpoint (**Section 3.2**). The next section gives a brief overview of the research methods that were considered and explains the rationale behind methodological choices (**Section 3.3**). Then the following section provides a detailed description of how the selected methods were synthesised into a coherent research design (**Section 3.4**). This section also elaborates the strengths and limitations of the various research methods employed – qualitative interviews, questionnaire, secondary data analysis of interview data, co-design approach. After discussing methods, the next section details how research rigour was ensured in this thesis, along with a discussion regarding research credibility and reliability criteria (**Section 3.5**). The penultimate section examines the ethical considerations of this research (**Section 3.6**). The chapter concludes with a summary of the topics covered (**Section 3.7**).

### 3.2 Philosophical assumptions

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#### 3.2.1 Research Paradigm

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The notion of ‘paradigm’ was introduced by Kuhn (1970) in his seminal book 'The structure of scientific revolution'. He argued that before undertaking any scientific inquiry, one must reflect upon their answers to questions regarding the nature of reality, the relationship between reality and the

one looking for reality, and the methods employed to know that reality. Thus, an adherence to a particular research paradigm is not just a window into the researcher's epistemic and ontological perspective but is also an instrument in guiding a researcher in the adoption of appropriate research methods (Guba & Lincoln 1989; Denzin & Lincoln 2005). Hence before explaining the research design and methodologies used in this thesis, it is imperative to establish the research paradigm, to justify the choice of methods.

Social science research methods literature is strewn with examples of paradigmatic war between proponents of qualitative research and adherents of quantitative research methods (Bryman, 2007; Kelle, 2001; Morgan, 2007; Teddlie & Tashakkori, 2009). However, such arguments indicate strong connotations of dichotomy. Such dualistic perspective on research strategies has been severely contested in favour of a more symbiotic adaptation of the two, harnessing advantages from both the methods (Bryman, 2006; Ghiara, 2020; Guetterman et al., 2019; Timans et al., 2019). To that end, Guba and Lincoln (1994) attempted a succinct categorisation of various research paradigms. Based on the ontological belief, epistemological relationship, and methodological questions posed by the inquirer, they classify the paradigms with positivism and post-positivism on one side and critical theory and constructivism on the other. On the quantitative side, positivism claims that there is only one truth and reality is measurable with reliable tools. Constructivism, on the other side, claims that there is no one single truth because participants construct truth and reality must be interpreted through the participants by the researcher using qualitative approaches. Critical paradigm emphasises that there is no single truth because it is built on society; therefore, it is socially constructed and interpreted (Bryman, 2012). Critical research is deliberately critical with the purpose to change society, this type of research encourages participatory or action research (Seale et al., 2014). Pragmatism tries to bridge the gap between “structuralist orientation of older approaches and the naturalistic methods and freewheeling orientation of newer approaches” (Kaushik & Walsh, 2019, p.2).

**Table 3.1** presents a descriptive summary of various research paradigms and associated philosophical assumptions.



**Table 3.1: Descriptive summary of research paradigms and their philosophical assumptions (Based on (A. Bryman, 2012; Burrell and Morgan, 2019; John W Creswell and Clark, 2017))**

<b>Research Paradigm</b>	<b>Ontology (Nature of reality)</b>	<b>Epistemology (What can be known; relationship being the knower and known)</b>	<b>Methodology (How knowledge is gained)</b>	<b>Products (Forms of knowledge produced)</b>
<b>Positivism</b>	Realism - There is one reality which can be studied, captured, and understood	Dualism - The reality of the world can be explained; Knower is separate from the known	Experiments, Surveys, Correlation studies, Quasi-experiments, Statistical analysis, Cause-effect relationship	Facts, theories, laws, predictions
<b>Postpositivism</b>	Critical realism - Reality exists but it can never be completely captured. Only approximate estimations can be made	Dualism not possible - Approximations of reality; Researcher is the instrument for collecting data	Rigorously defined qualitative methods, Frequency counts, Low-level statistics	Generalisations, descriptive studies, Grounded theory
<b>Constructivism</b>	Multiple socially constructed realities exist	Subjectivist - Knowledge is constructed; researcher and participants co-construct understandings	Naturalistic qualitative methods	Case studies, narratives, interpretations, reconstructions
<b>Interpretivism</b>	Relativist - Multiple realities exist,	Subjectivist - Knowledge is interpreted;	Hermeneutical, dialectical,	Narratives about individual experiences and

	and but real essence of reality cannot be known	researcher interprets understanding	qualitative methods	perceptions of individuals
<b>Critical</b>	Historical – Reality is created and shaped by social structures	Subjectivist - Knowledge is constructed; researcher and participants co- construct understandings	Dialogic methods, observations, interviews	Discourse analysis
<b>Pragmatism</b>	Knowledge is based on experience; hence it is not a reality.	Knowledge is influenced by researcher's values and experiences; Researcher decides what is appropriate to study	Mixed methods approach, Researcher chooses methods based on the research objective	Depends on the research objective. Active creation of data and theories.

### 3.2.2 Pragmatic Approach

The research questions answered in this thesis were complex and called for a paradigm that allowed for flexibility. As discussed in the literature review (**Chapter 2**), PEU research is mostly embedded in the subjective ontology with interviews being the predominant method. On the one hand, examining the nature of uncertainty and its antecedents and consequences required capturing the individual interpretations and perceptions of uncertainty. On the other hand, SRL research employed validated questionnaires as an acceptable data collection method. There was also a need to examine the individual differences in SRL qualitatively. Furthermore, technology evaluation required a more participatory and design-based approach. Thus, studying these three constructs together required a flexible paradigm that allowed for multiple realities and a combination of various methods. The paradigm that best fit these requirements is pragmatism. Pragmatism rejects the dualistic nature of research methods and proposes that choice of research methods should be guided by requirement of the research problem rather than adherence to a single paradigm (Biesta, 2010)

In order to do justice to the nature of the research questions posed in this thesis, a pragmatist philosophical stance that employed a lens of ‘relativist’ ontology was assumed. According to Guba and Lincoln (1994), a relativist ontological axiom refers to realities in terms of

...multiple, intangible mental constructions socially and experientially based, local and specific in nature (although elements are often shared among many individuals and even

across cultures), and dependent for their form and content on the individual persons or groups holding the construction (pp.110-111).

Due to its allowance of multiple truths and multiple methods, pragmatism is regarded as the ‘philosophical partner’ for mixed methods research (Johnson & Onwuegbuzie, 2004, p.16). The following section elaborates the strengths and weaknesses of using MMR as a methodology.

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### 3.2.3 Mixed Methods Research (MMR)

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Mixed methods research (MMR) refers to employing methods from both quantitative and qualitative research methods (Creswell, 2018). Johnson and Onwuegbuzie (2004) define MMR as, “the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study” (p.17). They argue that it is a philosophical movement that looks beyond the dichotomy of paradigms by offering a “logical and practical alternative” (p.17). In the last two decades, MMR has emerged as a highly adopted methodology (Timans et al., 2019). It has advanced to the point that it is 'increasingly articulated, attached to research practice, and recognised as the third major research approach or research paradigm' (Johnson & Onwuegbuzie, 2007, p.112). Following are some of the key strengths and weaknesses of using mixed methods research:

**Table 3.2: Strengths and weaknesses of mixed methods research (Adapted from (Creswell & Pioano Clark, 2007; Denscombe, 2008; Johnson & Onwuegbuzie, 2004; Migiro & Magangi, 2011)**

Strengths	Weaknesses
Addresses broader and complex range of research questions	Adherence to a paradigm reflects one’s inherent philosophical assumptions. Mixing paradigms could be problematic and be rejected by methodological purists
Strengths of one method can be used to overcome the weakness of other	Researcher needs to possess both qualitative and quantitative skills
Provides high validity evidence due to affordances of triangulation of methods and convergence of findings	MMR can be difficult to execute if two methods need to be used simultaneously
Multiple methods allow for generation of more generalisable results	Due to multiplicity of methods and complex mixing and analysing procedures, MMR can be time consuming
Allows examination of different aspects of a topic	Data from qualitative and quantitative methods needs to be transformed to enable seamless integration in the analysis phase. Depending on

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the type of data available, this can be a complicated process

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As seen in **Table 3.2**, as with any methodology, MMR has its strengths and weaknesses. One of the main aims of this research was to explore the relationship between SRL and PEU. Since these are two highly complex cognitive processes, they call for an examination of both the qualitative aspects of nature and type of perceived uncertainty and the quantitative analysis of SRL behaviour in professionals. Hence, mixed methods research (MMR) methodology was employed to harness the strengths of both qualitative and quantitative methods.

MMR aided in undertaking thorough research and allowed for an examination of SRL and PEU from different aspects and for answering a broad range of research questions. An often-cited strength of MMR is its ability to use the strength of one method in overcoming the weakness of another, which was evident in Study 2, where qualitative interview data and quantitative survey data was used concurrently to answer RQ2. Quantitative data was used to test the hypothesis that SRL strategies are related to the type of perceived uncertainty. While the findings were generalisable to the population of the research context of CISI members, it did not contain insightful information about the participants' learning and uncertainty contexts and how they constructed the meanings of specific terms such as 'self-reflection' or 'self-efficacy'. The interview data provided this insight. MMR made it possible for findings from the survey to be unpacked by the thematic analysis of interview data and bolstered the qualitative findings with results from the hypothesis testing.

The researcher tried to minimise the weaknesses through several strategies. One of the disadvantages of MMR is that it is time consuming both from planning and execution perspective (Creswell and Clark, 2017). Hence, for answering RQ2, when an opportunity was presented in the form of interview data from Littlejohn et al.'s (2016) study of SRL behaviour of finance professionals from CISI (the same research context as the present study), it was decided to utilise that data instead of conducting a new set of interviews. This decision to utilise secondary data reduced the amount of time taken to plan and execute Study 2.

The second disadvantage of MMR is its reliance on the researcher's skills in both qualitative and quantitative methods. The researcher has been trained in both the methods and has used them previously in her research, thus addressing the concern of skill level in multiple research methods. Also, before conducting the first set of interviews, the interview schedule was piloted with colleagues and a few participants from the industry, to gain feedback on interview techniques and clarity of questions. Similarly, the questionnaire was piloted with the industry gatekeeper and a few other finance professionals before it was widely circulated amongst CISI members. This helped the researcher fine-tune her interviewing skills along with refining the interview protocol (Kvale & Brinkmann, 2009).

Nevertheless, another challenging aspect of MMR is the complexity of designing the research, such that the data can be meaningfully 'mixed' (Creswell & Creswell, 2018; Teddlie & Tashakkori,

2009). Johnson and Onwuegbuzie (2004) suggest that before designing an MMR study, a researcher must decide if:

- They want to operate within a single paradigm or not
- The research phases will be concurrent or sequential

The answer to the first question was guided by the paradigmatic and ontological assumptions outlined in **Section 3.2.2**. As this research is underpinned by ‘relativist’ ontology wherein reality is socially and experientially created, it was decided that the qualitative paradigm would be the dominant one. The decision for the second question was guided by Creswell's (2003) mixed methods design strategies (**Table 3.3**):

**Table 3.3: Mixed methods design strategies (Based on Creswell, 2003)**

<b>Design Strategy</b>	<b>Characteristic</b>	<b>Objective</b>
<b>Sequential explanatory</b>	Collection and analysis of quantitative data followed by qualitative data	To use results from qualitative study to explain and interpret the findings from quantitative study
<b>Sequential exploratory</b>	Collection and analysis of qualitative data followed by quantitative data	To explore a new phenomenon. This design is used for development and testing of a new instrument
<b>Sequential Transformative</b>	Collection and analysis of either quantitative or qualitative data first with results integrated in the results phase	To choose the methods that best serve a theoretical perspective
<b>Concurrent Triangulation</b>	Two or more methods used to confirm, cross-validate, or corroborate findings within a study. Data collection is concurrent	Generally, both methods are used to overcome a weakness in using one method with the strengths of another
<b>Concurrent Nested</b>	One of the methods is prioritised and guides the research, while another is embedded or “nested.”	The purpose of this design is to address a different question than the dominant or to seek information from different levels
<b>Concurrent transformative</b>	Theoretical perspective guides all methodological choices	To evaluate a theoretical perspective at different levels of analysis

The mixed-methods design choice was guided by the research questions. For instance, RQ2 required concurrent triangulation strategy where findings from validated questionnaire and secondary data analysis of interviews were triangulated to present a holistic picture of the SRL strategies employed by professionals. The overall research design was, however, concurrent nested, as qualitative methods (interviews, vignette technique, co-design approach) guided the research and was supported by quantitative methods (questionnaire). Before selecting these methods, a thorough analysis of the research methods was carried out (**Table 3.4**). The next section presents a detailed account of the various research methods considered for carrying out this research.

### 3.3 Research methods considered

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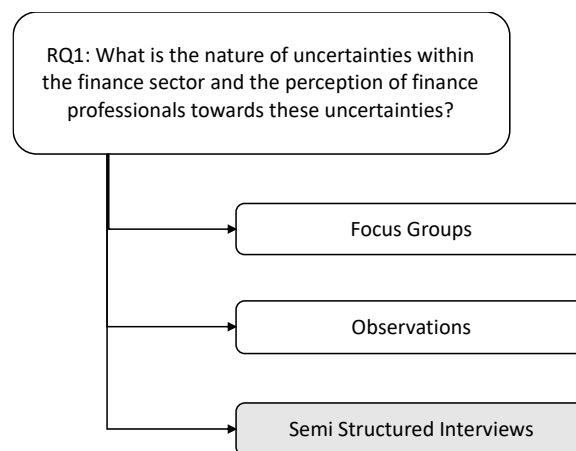
The choice of pragmatic paradigm and mixed methods research methodology afforded a choice of a wide range of research methods. Hence, the next step before the creation of the research design was to evaluate the various research methods and select the ones that were most congruent with the research questions. **Table 3.4** gives a descriptive summary of the advantages and disadvantages of the different research methods which were considered.

**Table 3.4: Research methods considered**

Research Method	Advantages	Disadvantages
Focus groups	<ul style="list-style-type: none"> <li>- provides an understanding of participants' point of view</li> <li>- allows emergence of nuances and contextual factors</li> <li>- allows for large sample sizes in qualitative study</li> </ul>	<ul style="list-style-type: none"> <li>- small samples may lead to biased results</li> <li>- it requires the researcher to be highly trained in conducting focus groups to be able to manage and control the discussion and avoid losing focus</li> <li>- coding data for analysis can be very complex</li> </ul>
Observations	<ul style="list-style-type: none"> <li>- allows capturing participant's behaviour in their natural environment</li> <li>- used in the initial stages of research to establish the</li> <li>- well suited to study complex interactions, and unpredictable social situations</li> </ul>	<ul style="list-style-type: none"> <li>- research access can be a challenge</li> <li>- could lead to observer bias (people behave differently when they know they are being watched)</li> </ul>

Semi-structured Interviews	<ul style="list-style-type: none"> <li>- allows for dynamic interaction with the participants, thus providing rich data about participant perspective</li> <li>- in-depth insights into participants' experiences and thought processes</li> </ul>	<ul style="list-style-type: none"> <li>- self-report bias</li> <li>- depends on the ability of the participants to clearly recall events and associated cognitive processes from past events</li> </ul>
Questionnaire	<ul style="list-style-type: none"> <li>- provides a broad range of information about participants, in relatively shorter time period as compared to interviews</li> <li>- high level of reliability (if validated survey instruments are used)</li> </ul>	<ul style="list-style-type: none"> <li>- self-report bias</li> <li>- fails to capture the complexity of participants' perspective</li> <li>- validity depends on the choice of survey instrument to ensure that the items capture what they intend to</li> </ul>
Vignette technique	<ul style="list-style-type: none"> <li>- provides a less personal way to explore sensitive/complicated topics</li> </ul>	<ul style="list-style-type: none"> <li>- may not completely capture the reality of participants</li> <li>- limited generalisability outside the vignette situations</li> </ul>
Secondary analysis of qualitative data	<ul style="list-style-type: none"> <li>- relieves the burden of participation from participants</li> </ul>	<ul style="list-style-type: none"> <li>- Methodological rigour</li> <li>- qualitative data analysis is subjectivist and interpretivist in nature, thus challenging the rigour of analysing data collected by someone else</li> <li>- due to in-depth and personal nature of qualitative data, several ethical challenges might arise in sharing it with other researchers for secondary analysis</li> </ul>
Experimental Design	<ul style="list-style-type: none"> <li>- allows more control to the researcher than naturalistic observation</li> </ul>	<ul style="list-style-type: none"> <li>- not suitable for research in workplace learning settings</li> </ul>
Trace Data/Learning analytics	<ul style="list-style-type: none"> <li>- As it is not self-report data, can bridge the gap between what people do and what they say they do.</li> </ul>	<ul style="list-style-type: none"> <li>- dependent on the availability of digital tools that can allow for tracking click-stream/trace data</li> </ul>

Think aloud protocols	- Provide information about the participant's behavioural patterns and cognitive processes while performing a task	- will only capture the thought processes while doing the task for a short period - the process of verbalising the thoughts may produce biased results, as it might make them conscious.
Co-design approach of Design-based research methodology	- Empowers the participants with increased 'agency' in research design and strategy for future use - Help refine the intervention design and strategy for future use	- time consuming due to its iterative process - participants do not think like designers, so the feedback might not be feasible to incorporate



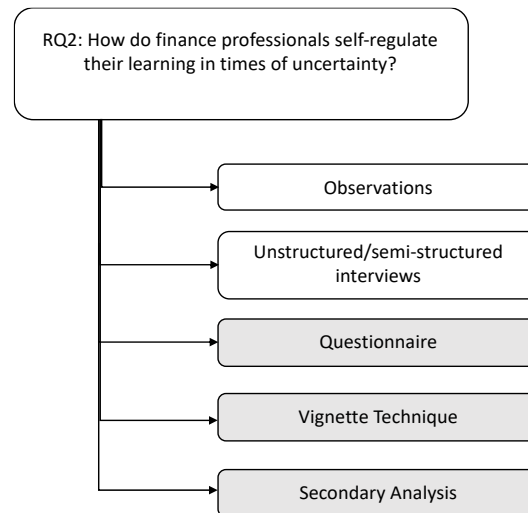
**Figure 3.1: Research methods evaluated for RQ1**

RQ1 required capturing the experiences and perceptions of professionals about the uncertainties they face in their work life. PEU is a much-researched phenomenon, thus the data collection did not require a purely inductive approach such as grounded theory. However, it is not frequently studied in the context of the finance sector. Hence RQ1 was mostly exploratory and called for methods that would provide preliminary insights into the perceptions about uncertainty and types of uncertainties in the finance sector. Thus, the following methods were considered for this study - Focus groups, observations, and semi-structured interviews (**Figure 3.1**). Arranging focus groups and observations would have been challenging due to logistical issues such as research access and the heavy time demands from the participants. It would have been difficult finding a time that is convenient for all participants to convene. Also, the study was carried out in CISI, which is a chartered institute and not the actual workplace of professionals, making it difficult to conduct an observation study.

Additionally, the main weakness of focus groups is the ability to maintain the focus of discussions. This challenge would have been made more complex by the large variations in the professionals' job profiles, experiences, and the domains within the finance sector that they operate in.



Qualitative interviews provided flexibility in terms of time and methods of participation – face to face or online interviews. They also allowed for capturing in-depth insights into professionals' experiences and perceptions of uncertainty, thus making them the appropriate choice for answering RQ1. Further information about interviews will be provided in **Section 3.4.1**.



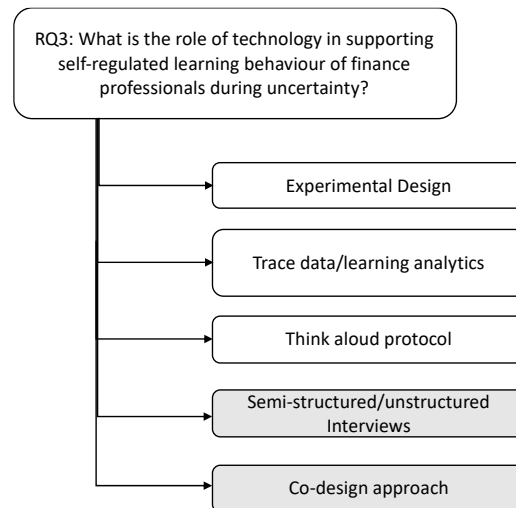
**Figure 3.2: Research methods evaluated for RQ2**

RQ2 aimed to examine the SRL behaviour of professionals in relation to the type of uncertainty they perceived. As seen in the literature review (**Section 2.3**), the relationship between PEU and SRL variables has not been examined before at an individual level. Hence, in order to examine the relationship from various aspects, it was decided to use multiple methods. Several methods were considered, namely: Observations, unstructured or semi-structured interviews, questionnaire, vignette technique, and secondary analysis (**Figure 3.2**). As discussed above, collecting observational data with finance professionals was not feasible due to access issues.

Moreover, both perceived uncertainty and SRL are latent variables, and as such difficult to 'observe'. Questionnaires and qualitative interviews both afforded unique advantages in exploring the relationship between PEU and SRL. Using questionnaires, allowed hypothesis testing with scope for generalising findings to wider professional learning contexts, whereas interviews could provide insightful data into how professionals planned their learning while perceiving uncertainty. Hence both questionnaires and semi-structured interviews were deemed the most pragmatic choices to address RQ2. They were 'mixed' using Creswell's (2003) concurrent triangulation mixed-method design strategy (see **Section 3.2.3**).

A challenge with using questionnaires to capture the SRL behaviour in relation to the perception of uncertainty was ensuring the standardisation across participants in terms of the uncertainty they are perceiving. Vignette Technique (Mulder, 2015) was considered as a possible solution to this problem. Vignettes are short descriptions of hypothetical situations which can be used in surveys to trigger certain thoughts or emotions in participants (Finch, 1987). As they could provide a tangible trigger to induce a perception of uncertainty in the professionals, they were included with the questionnaire. More information about how vignettes were used will be covered in **Section 3.4.3**.

While designing the research, an opportunity was presented to use previously collected interview data that examined the SRL behaviour of professionals through their work practices. Hence it was decided to use secondary analysis along with the questionnaire. More details about the secondary analysis method will be covered in **Section 3.4.4**.

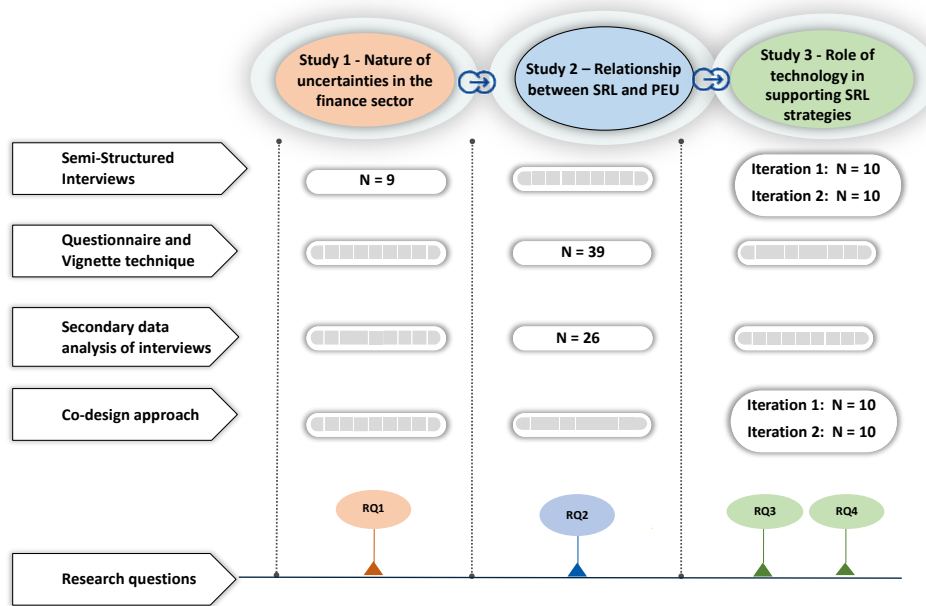


**Figure 3.3: Research methods evaluated for RQ3 and RQ4**

A conceptual framework – Learning in Uncertainty (LiU) framework elaborating the SRL strategies employed by professionals based on the type of uncertainty they perceived was created based on the findings from RQ1 and RQ2. RQ3 examined the role of technology in supporting the ‘learning in uncertainty (LIU)’ conceptual framework and investigated the perceptions of professionals on the technology support. Based on previous research carried out in this area (Siadaty et al., 2009, 2011; Siadaty, Gašević, et al., 2012) (see **Section 2.6 for more details**), several methods were considered: experimental design, trace data/ learning analytics, think-aloud protocol, semi-structured interviews, and co-design approach (**Figure 3.3**). Experimental design and trace data capturing both required a sophisticated technological intervention that could be implemented on a large scale within the organisation. While validating the LiU framework with a full-scale implementation of the technology prototype would have been beneficial, it did not align with the research objective. Hence an initial validation of the perceived efficacy of the framework was planned in Study 3. RQ4 aimed to examine the perceived efficacy of the LiU framework underpinning the technology intervention. Hence it was answered with the same data collected to answer RQ3.

Co-design is a joint designing technique that allowed the researcher to work with the finance professionals to jointly design a technological scaffold that could support their SRL. Semi-structured interviews enabled swift feedback mechanism to design the technology scaffold iteratively. Hence a co-design approach, along with semi-structured interviews, was adopted to capture the perceptions of professionals about the technology usage in supporting their SRL.

**Figure 3.4** captures the graphical representation of methods used across the three studies and their mapping to the research questions being addressed.



**Figure 3.4: Visual representation of the mixed methods in this thesis**

This section provided justification for the methods selected to answer the three research questions. In-depth discussion about each of the methods will be covered in **Sections 3.4.2 to 3.4.6**. How these methods were synthesised in a meaningful research design will be discussed in **Section 3.4**.

### 3.4 Research Design

Based on the epistemological and ontological views elaborated in **Section 3.2**, a mixed-methods approach was deemed to be the most appropriate. This section presents an overview of how the mixed methods approach was reified into research design. There were three main objectives of this research –

- 1) To examine the nature of uncertainties typically encountered by finance professionals and how they perceive uncertainty in terms of its antecedents and consequences

The research question that addressed this objective was:

**RQ1:** What is the nature of uncertainties within the finance sector and the perception of finance professionals towards these uncertainties?

- 2) To examine the SRL behaviour of professionals in relation to the type of uncertainty they perceived

The research question that addressed this objective was:

**RQ2:** What are the SRL strategies employed by finance professionals during times of uncertainty?

**RQ4:** How do the finance professionals perceive the usefulness of the LiU framework in recommending SRL strategies based on the type of PEU?

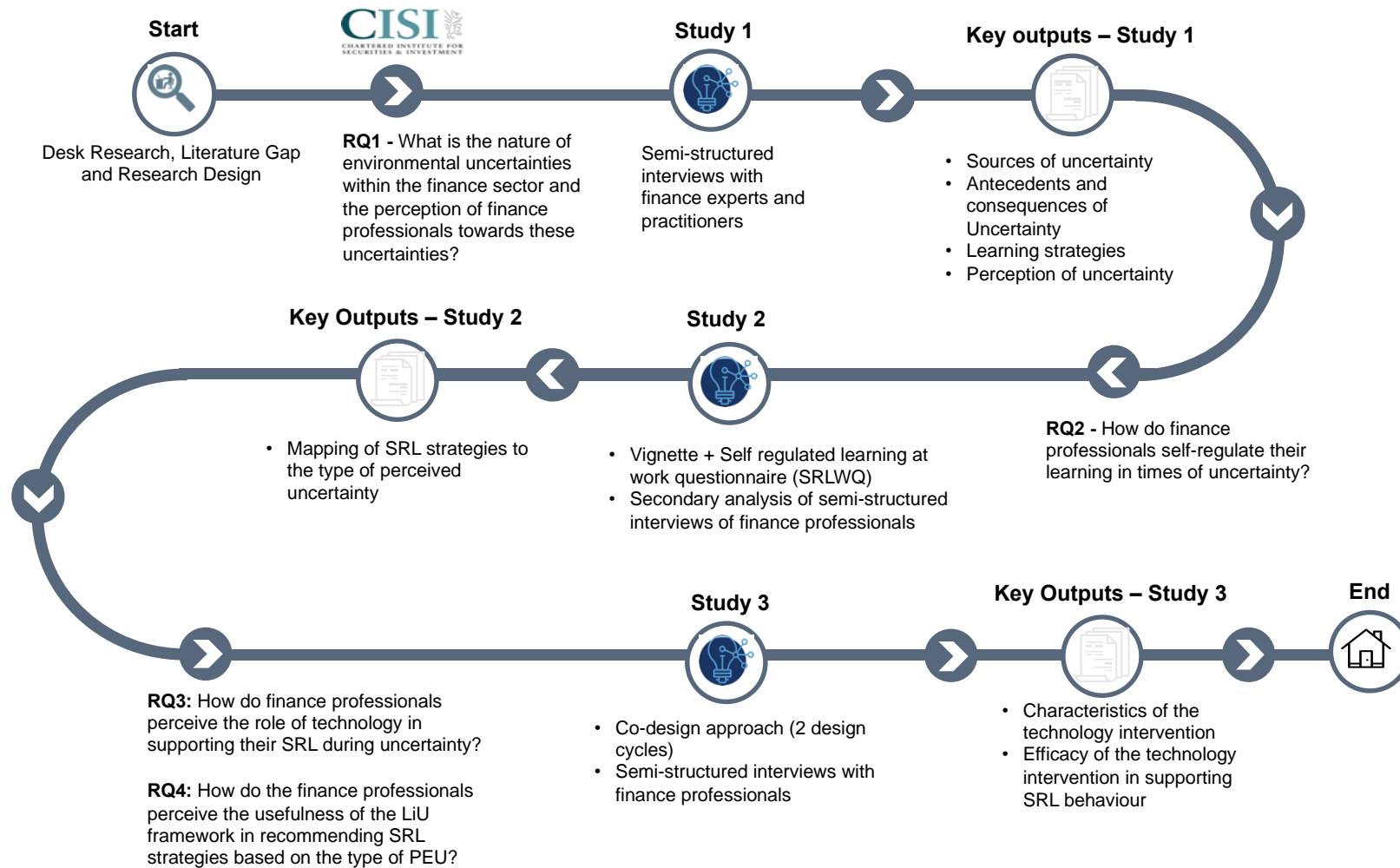
3) To evaluate the role of technology in supporting their SRL behaviour.

The research question that addressed this objective was:

**RQ3:** What is the role of technology in supporting SRL behaviour of finance professionals during uncertainty

Three interlinking studies were planned to address each of the research questions.

**Figure 3.5** presents a visual representation of the research design adopted to answer the research questions.

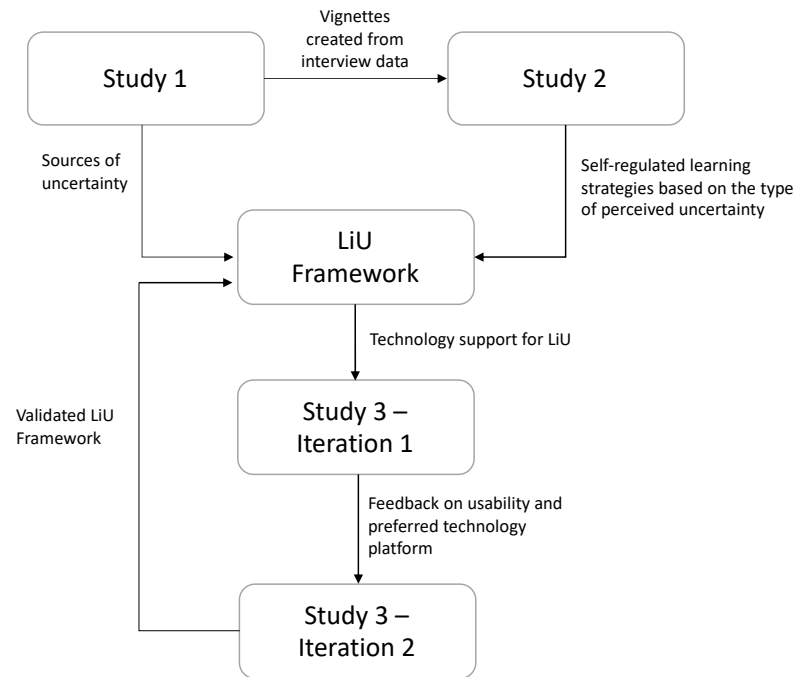


**Figure 3.5: Visual representation of the research design**

Study 1 aimed to set the stage with exploratory research examining the nature of uncertainty, sources of uncertainty within the finance sector, and the perceptions of professionals towards these uncertainties in terms of their antecedents, consequences, and strategies employed to manage the uncertainty perception. As discussed in **Section 3.2.3**, semi-structured interviews were selected as the most appropriate method for answering this research question. Interview data contained detailed descriptions about the specific uncertainty situations typically encountered by professionals. These descriptions were condensed into short vignettes which were used in Study 2 to trigger uncertainty perception while answering the questionnaire items.

Study 2 examined the SRL behaviour of professionals during times of uncertainty. Uncertainty vignettes created from findings of Study 1 were used in the questionnaire. Secondary analysis of previously collected interview data was carried out to enhance the validity of the study. Analysing the questionnaire data and triangulating the findings with the themes from secondary analysis gave a framework of SRL strategies used when perceiving a particular type of uncertainty (state, effect, response). These findings were used as the basis for designing the technology scaffold, which was evaluated in Study 3.

A 'Learning in Uncertainty' (LiU) conceptual framework elaborating the SRL strategies employed by professionals based on the type of perceived uncertainty was created based on the findings from Study 1 and Study 2. Study 3 had two objectives: 1) to evaluate technology support for LiU framework and 2) to validate the LiU framework. In order to evaluate the technology support in terms of ease of use, ease of integration (with CISI learning system), and perceived benefits, two iterations of design cycle were planned. The first iteration focused on requirement elicitation regarding usability features and preferred technology platform. The second iteration aimed to implement feedback from Iteration 1 in enhancing and customising the technology support (Iteration 2). The outcome of Study 3 was an implementable framework for supporting SRL behaviour in uncertainty. It also consisted of a set of recommendations and guidelines for professionals and organisation (CISI). **Figure 3.6** captures the linkages between Study 1, Study 2, and Study 3.



**Figure 3.6: Visual representation of linkages between the three studies**

Detailed descriptions of each of these methods will be covered in **Sections 3.4.1 to 3.4.5**.

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### 3.4.1 Interviews

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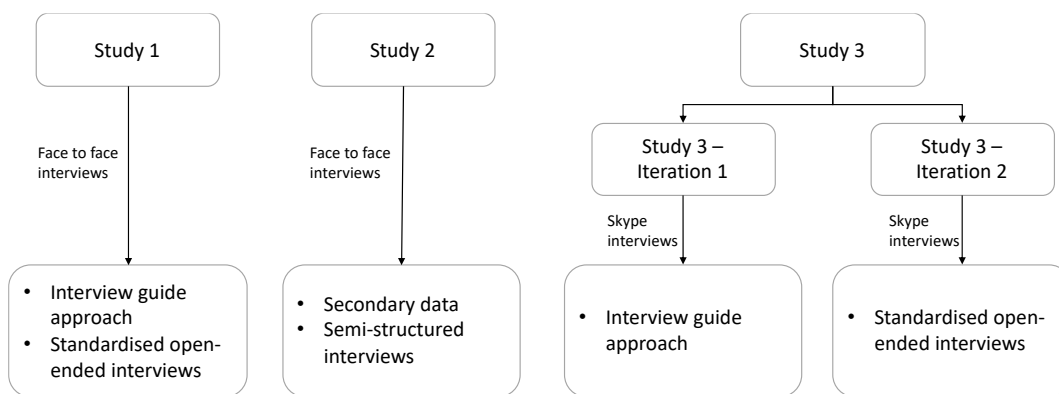
Qualitative research interviews are a channel to discover the meaning of actions from the descriptions of experiences shared by participants (Kvale, 1996). Patton (2002) classified interviews into four types (p.206):

- Informal conversational interview – Question wordings and topics are not predetermined as they emerge in a natural conversational manner.
- Interview guide approach – Question topics are predetermined; however, sequence and wordings are decided by the researcher during the interview.
- Standardised open-ended interviews – Question topics and wordings are decided in advance, and all the participants are asked the same set of questions.
- Closed quantitative interviews – Questions and response choices are predetermined, and the participant chooses from the given options.

Interviews are often used in management and organisational literature to investigate the PEU of professionals. For example, Ashill and Jobber (2010) conducted twenty in-depth interviews with subject matter experts from large organisations. They validated Milliken's three constructs of state, response, and effect uncertainty, based on thematic analysis of the interview data. Similarly, Lopes (2010) conducted unstructured interviews to investigate the decision-making process in uncertainty using complexity theory. Even in SRL literature, qualitative interviews find a place of prominence.

Margaryan et al. (2013) conducted twenty-nine semi-structured interviews in the energy sector to explore the SRL strategies employed by professionals for the attainment of their workplace learning goals and the organisational factors that affect these strategies. Interviews also have been extensively used in technology supported SRL studies during the evaluation phase of digital prototypes. For instance, Siadaty et al. (2010) conducted explorative interviews for “requirements elicitation” (p. 352) for evaluating the early prototype of the personal learning goal management module. They followed it up with semi-structured interviews to capture the technical details that had an impact on the perceived usage and acceptance of the software system.

As seen in **Figure 3.7**, interview data was used in all the three studies, albeit slightly differently.



**Figure 3.7: Graphical representation of interview usage across the three studies**

Study 1 had two main objectives – one was to identify the key sources of uncertainties in the finance sector; the second was to examine the perceptions of professionals in terms of antecedents and consequences of uncertainty and how they perceived it. This required delving deep into the professionals' context of the uncertain situations along with their cognitive and metacognitive thought processes that framed the perception of that situation. Hence, it called for a method that afforded the flexibility to probe for underlying values, beliefs, and assumptions while also had a structure that allowed for comparison across responses. Qualitative interviews were chosen as the data collection method after much deliberation and careful evaluation of other research methods (see **Section 3.3**). As per Patton's (2002) classification, a semi-structured interview schedule was prepared for RQ1 that had elements of both interview guide approach and standardised open-ended interviews (see **Appendix 6 and 7**). The interview data provided detailed and thick descriptions of what the participants did, thought, and felt (Robson, 2002), presenting a detailed account of their uncertainty experiences. The detailed descriptions of these uncertainties provided by the participants were distilled into short vignettes which were used in Study 2 for contextualising uncertainty, in the questionnaire.

The interview data used in Study 2 was secondary data collected by Littlejohn et al. (2016) through a semi-structured interview schedule (see **Appendix 10**). The details of how this data was prepared for secondary analysis will be discussed in Chapter 5.



Interviews conducted in Study 3 were in conjunction with the co-design approach. In this study, the participants were asked to perform certain tasks relating to SRL strategies in the prototype. This was followed by a short interview to capture feedback and any specific requirement about the prototype. The main objective of the interviews conducted in the first iteration was to capture the usability from design and technology platform perspective. Hence the interview schedule followed Patton's (2002) 'interview guide approach' (see **Appendix 12**), where the topics regarding core functionality, usability, and effectiveness in supporting the SRL behaviour were predetermined. However, the interviews were more of a conversational nature and did not follow a fixed pattern. The main aim of the interviews in the second iteration was to investigate the professionals' perception of technology usage in supporting their SRL in uncertainty. Hence a standardised open interview schedule was designed to include all the questions from the technology acceptance model (Davis, 1989) (see **Chapter 2, Section 2.9**).

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### 3.4.2 Questionnaire

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Questionnaires are a commonly used method for collecting self-reported information from a large sample of respondents about their characteristics, thoughts, feelings, perceptions, behaviours, or attitudes (Creswell & Clark, 2017; Robson, 2002). As outlined in **Table 3.4**, psychometric questionnaires have various advantages, such as the ability to collect a large quantity of data in shorter time frames as compared to conducting interviews. However, Cohen et al., (2007) argue that the shorter time frames are 'counter-balanced' by the time and effort required to “develop, pilot, and refine the questionnaire” (p. 377). Despite its limitations, it is a widely used method in SRL research as evidenced from a large number of validated questionnaires for measuring SRL (Boekaerts, 1999; Efklides, 2002; Magno, 2011; Pintrich et al., 1993; Zhou & Winne, 2012; Zimmerman & Martinez-Pons, 1988). Thus, it was chosen as an appropriate data collection method to answer RQ2, which examined the SRL strategies of professionals.

Using questionnaires served several purposes. One, it was easier to reach a wider range of professionals in less time. It was also convenient for professionals, as they could participate in the research in their own time. As designing the technology intervention in Study 3 was dependent on the findings of Study 2, it was important for the timely capture of the data. As discussed in **Section 3.3** another method considered for this Study 3 was interviews. However, conducting a large number of interviews to collect information that could be useful for developing the intervention in Study 3 would require a large amount of time. Questionnaires allowed for timely capture of data. They also afforded triangulation of data with the secondary analysis of interviews (**Section 3.4.4**) that increased the validity of findings and enhanced research rigour.

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### 3.4.3 Vignette technique (VT)

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A methodological challenge encountered in designing the questionnaire of Study 2 was ensuring standardisation across the participants in terms of the uncertainty they were visualising while answering the survey questions. Vignette technique (Mulder, 2015) was adopted as a solution to this problem. Vignette is a short description of a hypothetical scenario that can provide contextual information to the participants (Finch, 1987). Vignettes have been successfully used in previous organisational research to study complex cognitive, emotional, and behavioural attitudes (Poulou, 2001; Rungtusanatham et al., 2011). For example, Barrera and Buskens (2007) designed a vignette experiment to unpack the distinction between imitation and learning for various levels of uncertainty. They used the paired comparison method, in which they presented the participants with a pair of vignettes asking them to choose one. This method made it easier for the participants to choose from a pair rather than rate multiple vignettes as per their preferences. Another method closely related to vignettes is the critical incident technique (CIT), in which participants are asked to write down their own ‘incident’ related to the research topic rather than choosing from a set of vignettes. Bauer and Mulder (2010) used both the methods in their study on learning from errors and conducted comparative analysis of the methods. They found that response rate for CIT for much lower than that if VT. This could have been due to the time and effort required to write down the incidents. They found that one of the limitations of VT is that, unlike CIT it could not be used to investigate “actual past behaviour”, but could be useful in investigating “intended behaviour” (Mulder, 2015, p.267). Hence, they proposed that vignettes should be created after interviewing experts in a field to “elicit relevant cases on which to base the vignettes” (p.267). In their study, Bauer and Mulder (2010) used semi-structured interviews with experts (nursing supervisors) to collect authentic examples of learning from errors. Hence this technique was deemed appropriate for use in the study of learning in uncertainty due to the precedent set by studies on similar topics.

Uncertainty vignettes were created from the rich descriptions of uncertain situations described by participants in Study 1. These were used in the questionnaire as a tangible trigger to induce an uncertainty perception. The responses from this survey revealed the mapping between SRL strategies and perceived uncertainty. **Table 3.5** shows an example of an uncertainty vignette created based on the description of uncertainty caused due to currency movements in response to Brexit. The other vignettes that were used in the questionnaire addressed the topics of

- Passporting rights and Brexit
- FinTech development
- Socially and ecologically responsible investments

**Table 3.5: Example of an uncertainty vignette used in the Study 2 questionnaire**

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**Vignette 1 – Currency Movements**

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Imagine, you face the following work situation:

Despite recent broad-based recovery in global growth, it is not clear what impact Brexit will have on the level of investment in the UK. Brexit triggered a sharp depreciation in the Pound Sterling, and parallels have been drawn with the fall of Sterling in 1992 (devaluation) and 2008. In 1992, the Pound's devaluation led to growth in the UK economy. Conversely, in 2008, in the wake of the financial crisis, problems with Sterling led to bleaker future prospects for the UK, since the nation's most important export industry – the finance sector – was in serious difficulties. Therefore, it is unclear what the consequences of any further change in Sterling's value will be. With your team, you are given an assignment to analyse the consequences of further currency movements and report your conclusions to the Board. Irrespective of the findings of your report, it is clear that these findings will have consequences for your organisation.

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Further details about other vignettes used in the study and how they were validated will be covered in Chapter 5 (Section 5.2.1).

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### **3.4.4 Secondary data analysis**

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Secondary data analysis (SDA) of qualitative datasets collected from previous research has been gaining momentum (Heaton, 2004; Irwin, 2013). Funding bodies are also putting out calls specifically to use secondary data analysis to make maximum use of the data collected<sup>4</sup>. Hinds et al. (1997) assert that using secondary data is a “respected, common, and cost-effective approach to maximising the usefulness of collected data” (p. 408). It is used in innovative ways to answer new research questions from existing qualitative data (Bishop, 2007; Fielding, 2000; Notz, 2007). Hinds et al. (1997) proposed four ways of conducting SDA:

- a different researcher using a different study focus to that of the parent study
- using a sub-set of data from the parent study to conduct an in-depth analysis of previously unexplored concepts within the data
- researcher using their data from a previous study and analysing it with a different focus
- combining parent data set to a newly collected data to refine the research questions from the parent study

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<sup>4</sup> Secondary Data Analysis Initiative (SDAI) Call from ESRC - <https://esrc.ukri.org/files/funding/funding-opportunities/sdai-call-specification/>

As outlined in **Table 3.4**, there are several advantages of using qualitative data for secondary analysis. For instance, Heaton (2004) urged researchers to utilise previously collected interview data for secondary analysis, as it “relieves the burden of participation from research participants and community partners who collaborate with researchers to identify, access, and recruit research participants” (p.83). In Study 2, data from Littlejohn et al.’s (2016) study presented an opportunity to analyse the self-regulation strategies of professionals in different types of real-life work situations (context of the original study is elaborated in **Chapter 5, Section 5.2.2.1**). Experiences of recruiting research participants for interviews in Study 1 and the survey in Study 2 revealed the challenges in participant recruitment in the finance sector. Previous researchers have also reported similar challenges (Milligan et al., 2015) while enlisting participants from the finance sector. Thus, utilising secondary data prevented duplication of efforts on the part of the participants in providing a similar set of data to two different researchers.

Yet, there are also some concerns about SDA related to research rigour. Ruggiano and Perry (2019) assert that due to the inherently subjective nature of qualitative research, using interview data collected by someone else might lead to interpretation bias or misinterpretation of data. This concern was mitigated in Study 2, as the semi-structured interview schedule (SRLWQ) was the same as that used by Littlejohn et al. (2016) in their study (see **Section 5.2.2.1** for more details). Thus, the researcher had an in-depth knowledge of the concepts included in the interviews. Adopting SDA allowed for answering research questions that might have been otherwise difficult to answer using primary data.

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### **3.4.5 Design-based Research (DBR)**

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Design-based research (DBR) methodology stems from the early works of Brown (1992) and Collins (1992), which attempted to bridge the gap between educational research conducted in controlled laboratory settings and the needs of practitioners in real-world classroom settings. Since then, DBR has been widely researched and used, especially in the area of technology enhanced learning practices (Anderson & Shattuck, 2012). The unique characteristic of DBR is its iterative process that expects the researchers to systematically modify and adjust the interventions such as to allow iterative examination of any phenomenon in their naturalistic settings. Thus, DBR can be defined as ‘a systematic but flexible methodology aimed to improve educational practices through iterative analysis, design, development, and implementation, based on collaboration among researchers and practitioners in real world setting, and leading to contextually- sensitive design principles and theories’ (Wang & Hannafin, 2005, p.6). Through each iteration, the researcher reworks the intervention based on data collected using a range of research methods as per the contextual requirement. Thus, DBR methodology aligns with the pragmatic paradigm adopted in this thesis.

However, the flexibility of methodological choices afforded by DBR prevents standardisation of the process across different research studies. With a view to standardising the DBR methodology, McKenney & Reeves (2012) proposed three core processes that must be followed: 1) analysis and

exploration, 2) design and construction, 3) evaluation and reflection. Thus, the DBR approach emphasises the need to begin with contextual inquiry before designing and testing the interventions in their real-world settings (Treasure-Jones et al., 2019). This aligned with the mixed methods research design adopted in this dissertation, as Study 1 and Study 2 constituted the contextual inquiry phase of analysis and exploration, while Study 3 focused on the design and iterative evaluation and reflection.

There are several advantages to adopting the DBR methodology. One of the most touted benefit of DBR is that it is situated in the real-world context (Iversen & Jónsdóttir, 2018). This provides a sense of “validity to the research and ensures that the results can be effectively used to assess, inform, and improve practice in at least this one (and likely other) contexts” (Anderson & Shattuck, 2012, p.16). Also, another advantage of DBR is that it provides an active role to the participants in creation and evaluation of the intervention through a collaborative partnership between the researchers and practitioners. This provides them with a sense of ownership for the intervention and leads to increased adoption and ultimately change in practice if found to be useful (Design-based Research Collective, 2003).

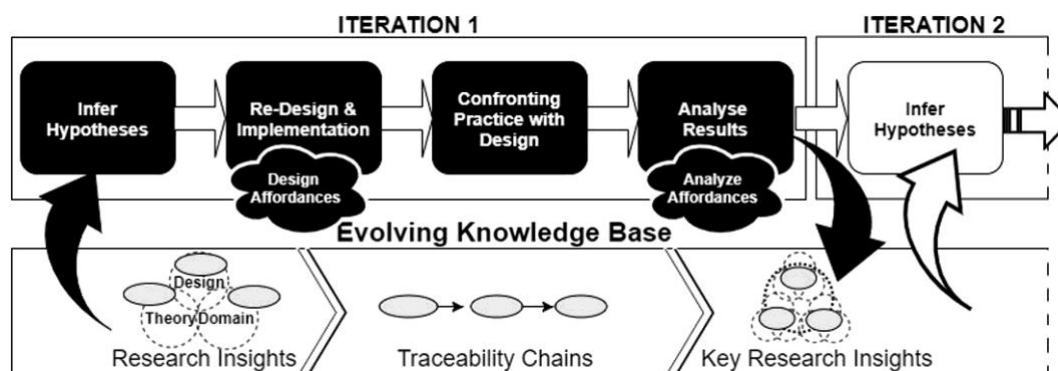
Yet, DBR is not without its limitations. A limitation that is especially relevant to the context of this thesis is the role of the researcher in the DBR process. Barab & Squire (2004) argue that, “if a researcher is intimately involved in the conceptualization, design, development, implementation, and researching of a pedagogical approach, then ensuring that researchers can make credible and trustworthy assertions is a challenge” (p. 10). To circumvent this limitation, Barab & Squire (2004) implore design-based researchers to “draw on methodological practices consistent with other qualitative methods to convince others of the trustworthiness and credibility of claims being advanced (p.10).

#### **3.4.5.1 Co-design approach**

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Co-design is an iterative DBR approach, that combines generative or exploratory research to identify the problem, with a developmental design that creates the solution. It is also known as generative design, co-creation, participatory design or co-operative design. Co-design can be used to create and evaluate a product, service or system. It can be applied to anything from an app to support learning activities to major learning and development practice reform processes. Recently, the terms ‘co-design’ and ‘co-creation’ gained popularity when referring to user and designer collaborations. Sanders (2000) distinguished between traditional design methods, that mainly used observational and ethnographic research, focusing on what people do, and traditional market research, which primarily used surveys, questionnaire or interviews to consider what people say and think. At a deeper level, co-design allowed participants to take part in design sessions and shifts the focus on what people make, as an expression of their ideas, thoughts and perceptions that may not emerge from conventional enquiry methods (Sanders, 1999). Dennerlein et al. (2020) argue that employing co-design methods in the workplace learning context is challenging due to its informal and highly contextual nature. They

propose an iterative practice-based method which they used for co-designing cognitive tools to support health care professionals' informal learning (**Figure 3.8**).



**Figure 3.8: Co-design process in workplace learning context (from Dennerlein et al., (2020), p.181))**

In their research, Dennerlein et al. (2020) applied the following stages in their co-design method:

- 1) Contextual Inquiry
- 2) Concept Creation
- 3) Co-design scenarios and wireframes
- 4) Co-design low fidelity prototype
- 5) Co-design high fidelity prototype
- 6) Co-design workplace integration (this was marked for future work in their research)

Their research team consisted of design experts, software development experts, learning theory experts, domain experts on the research team and they recruited clinical staff, admin staff, and management staff as stakeholders for the co-design process. The diversity in Dennerlein et al.'s (2020) team shows the enormity and depth of a full-fledged co-design research project. Naturally, this was beyond the scope of this dissertation. Hence, in Study 3 a sub-set of the co-design approach was adopted. The objective of Study 3 was to understand the role of technology in supporting SRL behaviour in uncertainty. To that end, the LiU framework created from findings from Study 1 and Study 2 was developed as a technological scaffold using co-design approach. There were two iterations of the design cycle. In the first iteration, the prototype was in the form of a mobile app. Based on the feedback of professionals following the first iteration, an intuitive website was designed, which was deemed easy to use as compared to the mobile app version. Further details on how Sander's (2000) framework was adapted to fit the purpose of Study 3 will be covered in **Chapter 6 (Section 6.2.1)**.

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### 3.4.6 Summary of methods

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This section highlighted how the mixed methods were synthesised into a coherent research design (**Figure 3.4**). As noted earlier, the research questions addressed in this thesis called for a

multifaceted approach to unpack the complex constructs of SRL and PEU. Hence a pragmatic paradigm using a mixed-methods approach was adopted. **Sections 3.4.1 to 3.4.5** covered a detailed overarching description of each of the methods adopted in the research design. Specific details about the settings, participants, and methods, along with the analytical strategies, will be covered in the subsequent chapters (**Chapters 4, 5, and 6**). Having established the paradigmatic, methodological, and research design choices following section discusses the reflections of the researcher to ensure that the study conducted is rigorous.

### **3.5 Research Rigour**

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Research rigour lies in the methodological robustness and relevancy of research purpose (Atkins & Wallace, 2012). Since the early 1980s, researchers have presented various criteria to evaluate the research rigour, including Lincoln and Guba's (1985) notable criterion for 'trustworthiness' in 'naturalistic inquiry'. Oancea and Furlong (2007) outline domains of quality and criteria (epistemic; technical; and phronesis), each with its own set of concerns, against which research can be measured. For discussing the rigour of this thesis, Oancea and Furlong's (2007) framework, chosen for its scope and depth, was adopted.

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#### **3.5.1 Epistemic Domain**

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The epistemic domain includes trustworthiness; contribution to knowledge; and transparency and explicitness in design and reporting.

##### **Trustworthiness**

Trustworthiness refers to the way in which researchers can persuade the stakeholders that their research is "worthy of attention" (Nowell et al., 2017, p.3). Lincoln and Guba's (1985) proposed techniques to establish trustworthiness include prolonged engagement, persistent observation, triangulation, peer debriefing, negative case analysis, referential adequacy and member checking. In this research, the researcher has attempted at least two techniques from the above list to ensure the trustworthiness of the data collected and research findings – triangulation and prolonged engagement. In RQ2, triangulation of methods was achieved by employing both questionnaire and secondary data analysis of interview data, and then comparing the results from both the methods. The prolonged engagement was ensured as the research was entirely carried out with CISI members, and the researcher was in regular contact with the industry gatekeeper to keep him updated with the research findings. He provided valuable industry perspective on the research findings and their relevance for practice.

Despite Denzin and Lincoln's claim that "credibility, transferability, dependability, and confirmability replace the usual positivist criteria of internal and external validity, reliability, and objectivity (2005, p.14)", Armstrong et al. (1997) emphasised the importance of calculating inter-rater



reliability for ensuring rigour in qualitative studies. Campbell et al.'s (2013) strategy of inter-coder reliability and agreement was employed along with thematic analysis of interview data. In all three studies, the coding scheme along with an interview transcript were presented to a fellow researcher. All disagreements were resolved through discussion with the researcher and coding scheme was updated accordingly.

Closely related to trustworthiness is the issue of transferability or translatability (Fitch, 1994), which means showing the applicability of the study in other contexts. This involves providing a 'thick description' (Lincoln & Guba, 1985) for the research and its context, so the possibility of applicability can be assessed. In order to address these criteria, the researcher provides a thorough description of the base that all the data, analysis and findings generated rest upon in each of the data chapters (**Chapters 4,5, and 6**).

Dependability (consistency) and conformability (neutrality) are interlinked, with their dependence upon an audit and audit trail, which involves examining the 'product' (data, findings, interpretations and recommendations) and check the support that they are being provided by empirical material and observations (Lincoln, 2002). Consistency can be sought by establishing an internal coherence of the research. External consistency was achieved by providing clear links between the three studies undertaken in this thesis (**Figure 3.6**). Excerpts from the interviews were used, and professionals were directly quoted in all the themes extracted during analysis, to ensure internal consistency. Furthermore, detailed information about analytical processes was presented in each of the data chapters, that helped the researcher identify features and relationships and transform data through interpretation.

## **Contribution to knowledge**

Oancea and Furlong (2007) assert that research should build on what is known and contribute to the field. As discussed in **Chapter 2**, a thorough review of the literature was carried out before undertaking the research, and research questions emerged from the identification of clear research gaps in the extant literature. The discussion section of each study chapter will refer again to this literature to place the results of this literature in the field and outline contribution to knowledge. Also, as discussed in **Section 2.6.2**, this research builds upon the works of (Littlejohn, et al., 2016; Milligan et al., 2015) to further the understanding of SRL of finance professionals and making several theoretical and methodological contributions to literature (see **Chapter 7, sections 7.2 and 7.3**).

## **Transparency and explicitness in design and reporting**

Transparency refers to the explicitness in the design and research and calls for the disclosure of relevant aspects of the process. The research undertaken in this thesis is explicit about its context, participants, and methodology. At every stage, a detailed description of the methodology, design aspects, information on interviews is explicitly provided. Mays (1995) contends that rigorous research design should ensure transparency to the extent of replicability. The researcher has ensured the



replicability of the research design by giving a detailed description of the research design process and how the studies were linked.

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### **3.5.2 Technical Domain**

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The technical domain questions the study's fitness to purpose and specificity.

#### **Fitness to purpose**

There are two aspects to this evaluation criteria – 1) academic fitness for purpose and 2) industry fitness of purpose. The academic fitness of purpose was fulfilled by the pragmatic approach with mixed methods research design, as discussed in **Section 3.2**. Another criterion about fitness to purpose related to the industry context. An ethical requirement of co-design research is to produce something of practical value to the participants. As technology was widely used at CISI for providing learning support to their members, they indicated an interest in a tangible framework which can be implemented in their CPD framework. Hence the fitness of purpose in the industry context was also fulfilled as the outputs from the research consisted of a set of guidelines for the practitioners and an implementable LiU framework.

#### **Specificity**

Specificity refers to “the ways in which the research responds to the needs of the users... as well as to the foreseeable contexts of use” (Oancea and Furlong, 2007, p.13). The findings from this research serve to add to the discourse in the field of PEU, SRL, and technology supported SRL. The findings from the study can be used to make specific recommendations to organisations and practitioners about how the conceptual framework can be integrated into the CISI learning system.

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### **3.5.3 Phronetic Domain**

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The phronetic domain addresses the transformation capability, deliberation and reflexivity, and timeliness.

#### **Transformation capability**

Transformation refers to the extent to which research can develop as educative and its capacity to stimulate further action. The transparency and contribution to knowledge discussions address this issue. The research findings and conclusions bring forth what would be unfamiliar or unrecognised discussions amongst professional learning- technology-perceived uncertainty nexus.

#### **Deliberation and Reflexivity**

This asks that research permit itself for self-reflection and self-development through a process of deconstruction for locating intersections of the author, subject, text and world. In this research,

reflexivity and critical self-reflection was part of the analysis process through which the researcher developed her findings. Basic analytic self-reflection and criticism contribute a lot towards the rigour of the research design as it allows inquiring the possibilities of unreflective knowledge, bringing the more unsettled field into view (Macbeth, 2001). The analytical reflexivity has been evidenced in this thesis by providing justifications of decisions made on research methods, analytical procedures, and research design.

### **Timeliness**

The substantive research topics explored in this thesis are highly relevant to the current times. We are currently living through a time of uncertainty induced by the devastating global pandemic. Since the COVID-19 outbreak, there have been several studies assessing the economic and macro-economic impact of the virus (Baldwin and Mauro, 2020; Brown, 2020; Das, 2020). These studies indicate that the financial sector is headed for unprecedented levels of uncertainty. Thus, studying how their learning can best be supported during periods of uncertainty is timely.

Based on the above discussion, a reasonable assertion can be made that this study employs appropriate sampling techniques, analytical strategies, and has a strong rationale for the research context, thereby enhancing the rigour of the research.

### **3.6 Ethical considerations**

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Conducting ethical research is one of the prime responsibilities of the researcher towards the academic community. Cohen et al. (2007) agree that it is impossible to anticipate and prepare for all ethical issues in advance; however, they assert the importance of abiding by an ethical code in order to bring discipline, direction, and credibility to their research. Hence, every possible measure was undertaken to ensure an ethically sound research study. To that end, Seedhouse's (1998) ethical grid was employed as a guiding framework to fortify the ethical strength of the study. This “epistemological device” (Stutchbury & Fox, 2009, p.492) designed by David Seedhouse provides a layered account of the ethical decisions involved in any research, consisting of individual, deontological, consequential, and external layers. These layers are approximately in tandem with the four ethical principles of internet-mediated research posited by Hewson et al. (2013): Respect for the autonomy and dignity of persons, scientific value, social responsibility, maximising benefits and minimising harm (p.5). Hence, the adoption of Seedhouse's (1998) grid should guarantee the ethical reliability of this study.

The individual layer of the ethical grid appertains to the respect for autonomy and privacy of the research subjects. This was one of the major ethical considerations while working with the finance professionals, as the nature of the information exchange during the interview process reveals (some word) information. In order to address this concern, once the interview data were coded, all the personally identifiable information was masked as per the Data Protection act. In order to warrant complete security, this data was safely stored in a password protected NAS server, solely owned and

accessed by the researcher. Moreover, the professionals were informed in advance about the nature of the research and were also required to sign a consent form that detailed the ways in which this data would be used. They were also given the option to opt-out of the research at any point of the interview.

Despite ensuring utmost data security, there are instances where the researcher needs to take certain ethical decisions with respect to the usage of available information, which may conflict with the quality of the study. This is especially true in case of the vignette interviews because there were times when the information divulged during these interviews was confidential, but at the same time had major implications on the interpretation of certain scenarios. In such cases, Hewson et al. (2013) suggest that "researchers should particularly consider the extent to which undisclosed observation may have potentially damaging effects for participants, before making decisions on whether to use such data and whether gaining valid consent is necessary. (p.7)". Such concerns are addressed in the deontological layer of the ethical grid. This layer signifies the appropriate manner for addressing ethical dilemmas, without much consideration for the consequences. Howe and Moses (1999) contend that the deontological view of ethics involves treating people 'as ends in themselves and never solely as means' (p.22). While coding, certain instances required the weighing of such ethical quandaries. For example, during the interviews, there were instances where certain pieces of information were shared in confidence, which if included in the vignettes would enrich the quality of the scenarios but could also potentially lead to personally identifiable situations. Hence, an ethical decision was made to refrain from making any such indirect connections, as that would imply the treatment of professionals as a means for furthering research rather than respecting their privacy and autonomy.

Another ethical consideration related to the deontological layer is associated with the collaboration with the gatekeeper. As this research was set in the industry context, there was heavy reliance on the industry gatekeeper. From connecting the researcher with participants to screening of ideas for the prototype, the CISI gatekeeper was actively involved in the research process. His involvement was certainly an asset to the research process, as it ensured relevance of the research to practice, thus maximising impact of the findings. Though, Singh and Wassenaar (2016) forewarn researchers of the ethical dilemmas that might arise from the gatekeeper being "coercive in influencing participant involvement in the research", and urge them to "respect the boundaries of the access granted" and "adopt an objective and formal stance to the research process" (p.43). Although such ethical conflict did not arise at any point during the research, the researcher took meticulous efforts to retain effective communication and buy-in at every stage of the research while preserving the academic integrity and objectivity of the research. For example, in Study 2 when the LiU survey was piloted with the gatekeeper, a suggestion was made to reduce the number of questions in the interest of brevity. As validated instruments were used, reducing the number of items would have impacted the validity of the scale, hence an objective decision was taken to not reduce the number of items in the survey.

The next consequentialist layer deals with the consequences of research for individuals as well as the society. However, since this study does not delve into any sensitive issues, it was devoid of any

major ethical concerns in this respect. Lastly, the external layer refers to the code of ethical practice laid down by any established institutions or the university. This research has been carried out as per the ethical guidelines laid down by the Open University's Human Research Ethics Committee (HREC), and appropriate approval was obtained before the commencement of research (HREC/2017/2506-Chaudhari).

### **3.7 Conclusion**

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This chapter gave an overview of the philosophical assumptions underpinning the methodological choices and research design. The next three chapters (**Chapters 4, 5, 6**) describe how each of the research questions were investigated using the research methods identified in this chapter. Detailed description of analytical methods and research instruments are presented along with the detailed discussion of the research findings in the context of reviewed literature in the next three chapters.

## Chapter 4: Study 1 – Nature of uncertainties in the finance sector

The previous chapter described the reification of research design and methodology used in this thesis based on the philosophical assumptions underpinning the research. This chapter describes the methods and findings from Study 1 undertaken in this research that investigated finance professionals' perception of uncertainty in terms of antecedents and consequences of uncertainty, nature, and sources of uncertainties they encounter in their work life. **Figure 3.5 (in Chapter 3)** presented the entire research design of this thesis. **Figure 4.1** captures the part of the research design covered in this chapter.

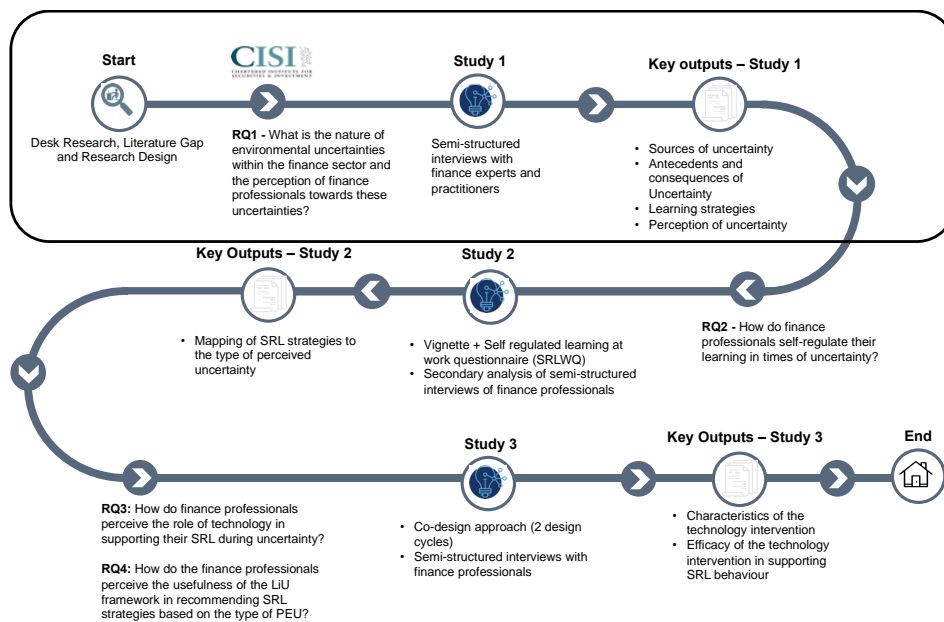


Figure 4.1: Scope of Chapter 4

The chapter begins with **Section 4.1**, that sets the context of the study by outlining the research questions that will be addressed in this study. Subsequently, **Section 4.2** explains the specific methods used in this study in relation to its settings and participants, creation of the interview schedule, and analytical strategies adopted. **Section 4.3** presents the findings of the study in relation to the research questions. The implications of these findings are discussed in context of the broader literature, in **Section 4.4**. **Section 4.5** highlights the limitations associated with the study. The chapter concludes in **Section 4.7**, where linkages to the other studies in this thesis are discussed.

### 4.1 Introduction

The distinction between risk and uncertainty in finance is rarely made (Gigerenzer, 2018). Traditional finance literature encompasses the objective nature of uncertainty by focusing on the quantitative measures of risk (e.g. probability models, stochastic programming), with a fundamental

assumption of a linear relationship between risk and return (Burzoni et al., 2018; Consigli et al., 2017; Jo & Sekkel, 2019). However, there is an emerging body of literature in behavioural finance that examines the subjective aspect of uncertainty in which decision maker's perception of uncertainty is a significant aspect of defining and understanding the processes of decision-making, innovation, and learning in uncertainty (Dow, 2010; Muradoglu & Harvey, 2012). In this thesis, uncertainty is conceptualised as per Milliken's (1987) framework of PEU. As discussed in the literature review (**Section 2.3**), Ashill and Jobber (2010) identified three variants within the two categories of objective and perceptual measures of environmental factors in Milliken's (1987) framework – 1) measurement of individual environmental characteristics; 2) measuring the perceptions about the uncertainty; and 3) a composite measure. In their review of literature, they noted varied sources of objective environmental uncertainties. Perception of uncertainty is related to the objective environmental uncertainty (Weiss & Wittmann, 2018), which is subject to change with time and context (Hertati, 2015). Hence, before examining the learning processes in uncertainty (which constitutes Study 2), it was essential to establish the nature of uncertainties within the research context and how professionals perceived them. The present study addresses that gap by establishing the nature of environmental uncertainties within the finance sector and examining how the finance professionals perceive them in terms of its antecedents and consequences. In doing so, this chapter answers the following research question:

**RQ1:** What is the nature of environmental uncertainties within the finance sector and the perception of finance professionals towards these uncertainties?

There are three aspects to answering RQ1, which are covered in the form of following research questions -

**RQ1.1** – What is the nature of uncertainties perceived by finance professionals?

**RQ1.2** – What are the antecedents and consequences of uncertainty as perceived by the finance professionals?

**RQ1.3** – In what ways do finance professionals respond to the periods of uncertainty?

The next section describes in detail the methods and procedures used to address these questions.

## **4.2 Methods**

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### **4.2.1 Settings and Participants**

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As discussed in the first chapter (**Section 1.1**), CISI was selected as the research context. The purpose of this study was to understand and contextualise the perception of uncertainty and the nature of uncertainties within the finance sector. Semi-structured interviews were conducted with invited practitioners from the UK finance industry who were CISI members, to provide a qualitative perspective on experiences of uncertainty in the workplace (see **Section 3.3** and **Section 3.4.1** for

more details about why this method was selected). In line with other studies that have identified ‘undesirable events’ leading to individual learning and organisational change (Bauer and Mulder, 2007), a small sample of purposefully selected participants were invited to take part in this study to identify key themes of uncertainty perception along with emerging interdependencies and relationships. The sampling approach taken in this study can be classified as purposeful sampling, i.e., particular professionals selected deliberately to provide essential data which cannot easily be gathered otherwise (Bryman, 2006; Silverman, 2000). The recruitment target was of ten participants. As per Singh and Wassenaar's (2016) suggestion to consult with the gatekeeper during participant recruitment phase in the interest of “fostering communication” and “responsible engagement” (p. 43), following selection criteria were jointly agreed with CISI:

- Members of CISI
- Professionals with at least a decade of experience within the finance sector or external observers such as academic experts researching finance sector
- Professionals with a strong understanding of the future of the global financial sector and in-depth knowledge of past and current uncertainties within the finance sector

Selection of participants ensured an equal balance of practitioners and experts within the various sub-domains, to incorporate multiple perspectives from practice and academia. The distinction between 'practitioners' and 'experts' is based on industry terminology rather than academic classification. CISI defines practitioners as professionals who are currently active in the finance industry. In contrast, experts were either academics who conducted research in the finance sector or organisational heads who possessed in-depth insights into the uncertainties in the global financial sector. This distinction certainly does not imply that experts lacked practical experience or that practitioners did not have domain expertise, yet there is value in making the explicit distinction between experts and practitioners. In mapping the professional learning journey from novice to expert, Boshuizen et al., (2006) assert that, “experts do not just know more than novices, they also have a different way of structuring their domain-specific knowledge”, and that experts can provide a “certain (very successful) perspective on a particular domain” (p.6). Hence the intention of the sampling strategy was to ensure as diverse perspectives as possible through maximum variation sampling (Suri, 2011).

Based on the criteria outlined above, a total of 23 professionals were identified. An introductory email was sent by the CISI gatekeeper, informing them about the research and inviting them to participate. A follow-up email was sent by the researcher with additional information about the research and its expectations from them. Of the 23 potential candidates that were contacted, 14 responded positively. Calendar dates were sent to all 14 of them, and they were asked to choose one as per their convenience. However, due to scheduling concerns and unavailability, 5 of them had to drop out. They indicated that they would be interested in participating in the later part of the research. Hence, they were again contacted for Study 2 and Study 3. Finally, 9 participants confirmed their availability, and interviews were set-up accordingly. **Table 4.1** illustrates the participant profiles and

their expertise in the finance sector. Interview participants were categorised based on their expertise, knowledge of the specific domain, and their practical knowledge of the sector. The average work experience of the experts was 33.2 years, while the practitioners was 15.5 years. Of the nine participants, two of them were female, and seven were male. As finance is a typically male-dominated industry, this sample was representative of CISI membership.

**Table 4.1: Study 1 participant profiles**

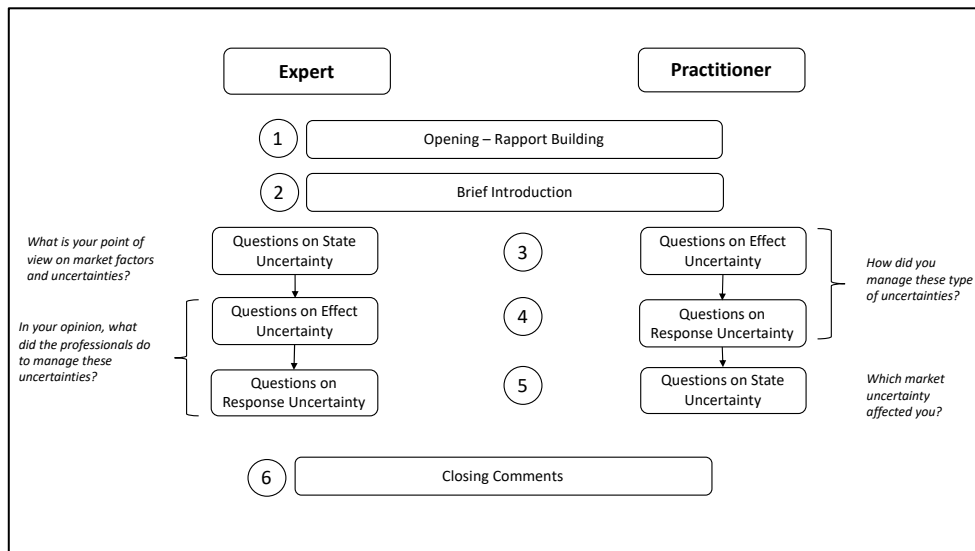
<b>ID</b>	<b>Category</b>	<b>Expertise</b>	<b>Gender</b>	<b>Years of Experience</b>	<b>Domain</b>
<b>E1</b>	Expert	Creator of a platform for industry practitioners and policy makers to share and debate evidence-based research and to agree a consensus on critical issues relevant to the Brexit negotiations;	Male	40	Wealth Management, Retail Banking, Operations and IT
<b>E2</b>	Expert	Research expertise on new and innovative areas in Financial Technology (FinTech)	Male	25	Compliance and Risk, Operations and IT
<b>E3</b>	Expert	Creator of training programs for the global association of risk professionals	Male	32	Wealth Management, Retail Banking, Operations and IT
<b>E4</b>	Expert	Expertise in enhancing the performance of profit-making, charitable and government organisations and investments in conditions of high uncertainty.	Male	27	Operations and IT
<b>E5</b>	Expert	Expertise in risk governance, personal accountability and crime, new financial markets	Male	42	Wealth Management, Retail Banking,



					Compliance and Risk
<b>P1</b>	Practitioner	Sector expertise in financial regulation and technology	Male	16	Wealth Management, Retail Banking, Operations and IT
<b>P2</b>	Practitioner	Focuses on professional standards and ethics in finance business	Female	11	Compliance and Risk
<b>P3</b>	Practitioner	Experience in Capital markets, asset management, Islamic finance, Fintech, private banking, green finance; development of financial market	Male	18	Wealth Management, Retail Banking, Compliance and Risk
<b>P4</b>	Practitioner	Significant experience in the Wealth Management Industry	Female	17	Wealth Management and Retail Banking

#### 4.2.2 Qualitative Instruments

As described in the previous section (**Section 4.2.1**), there were two categories of participants – experts and practitioners. Hence, two semi-structured interview schedules; for one for experts (**Appendix 6**) and the other for practitioners (**Appendix 7**) were created by operationalising Milliken’s (1987) definitions of state, effect, and response uncertainty (**Appendix 5**). The similarities and difference between these two schedules are outlined below (**Figure 4.2**).



**Figure 4.2: Difference between interview schedules of experts and practitioners**

An initial interview outline was developed with six broad sections. The first two sections included rapport building and introductory questions about their experience within the financial sector and general questions about their respective domains. The agenda and purpose of the interviews were also made clear to the participants. The next three sections of the interview schedule comprised of questions related to each of the three types of perceived uncertainties – state, effect, and response uncertainty (Milliken, 1987). The closing section consisted of an open-ended question that presented an opportunity to the participants for adding any extra information to the discussion.

As seen in **Figure 4.2**, the main difference between the interview schedule for experts and practitioners was the order in which they were asked to talk about the different types of uncertainties. The objective of interviewing the experts was to capture the 'outside-in' or experts' point of view of the uncertainty in the sector and gather information about examples of macro uncertainties affecting the finance sector (state uncertainty). Hence, they were asked questions that tapped into their expertise in global market trends and macro-level uncertainties. Subsequently, the questions on effect and response uncertainty were asked so as to elicit their understanding on how others managed the impact of those state uncertainties. For example – they were asked, 'in your opinion, what did the professionals do to manage these uncertainties'. While this question gave detailed insights into the experts' perception of how uncertainty impacted other professionals, it limited the understanding of how the experts' managed these uncertainties themselves. However, this information was obtained from the practitioner interviews. The objective behind interviewing the practitioners was to elicit examples of meso and micro uncertainties that were faced by the professionals in their day-to-day work life. Thus, the questions were framed to draw insights from their experiences to achieve this objective. The practitioners' interview schedule began by asking them about the impact of the major uncertainties that they encountered in this work life and how they responded to these uncertain events. A strength of this approach was that it allowed for comparison between experts and practitioners' perception of

different types of uncertainties, as it highlighted how the same uncertain event can be perceived differently based on the level of expertise.

Moreover, since this was a semi-structured interview, there was built-in flexibility in terms of the sequential flow of questions (Cohen et al. 2007). Also, as Robson (2003) points out, interviews offered a chance to follow up with the participants to understand the motives behind certain responses. The researcher used her judgement to elicit specific information to dig deep into the experiences and expertise of both experts and practitioners. However, the interview schedules served as a guide to help bring the conversation back to the topic at hand, in case there was a slight deviation of focus.

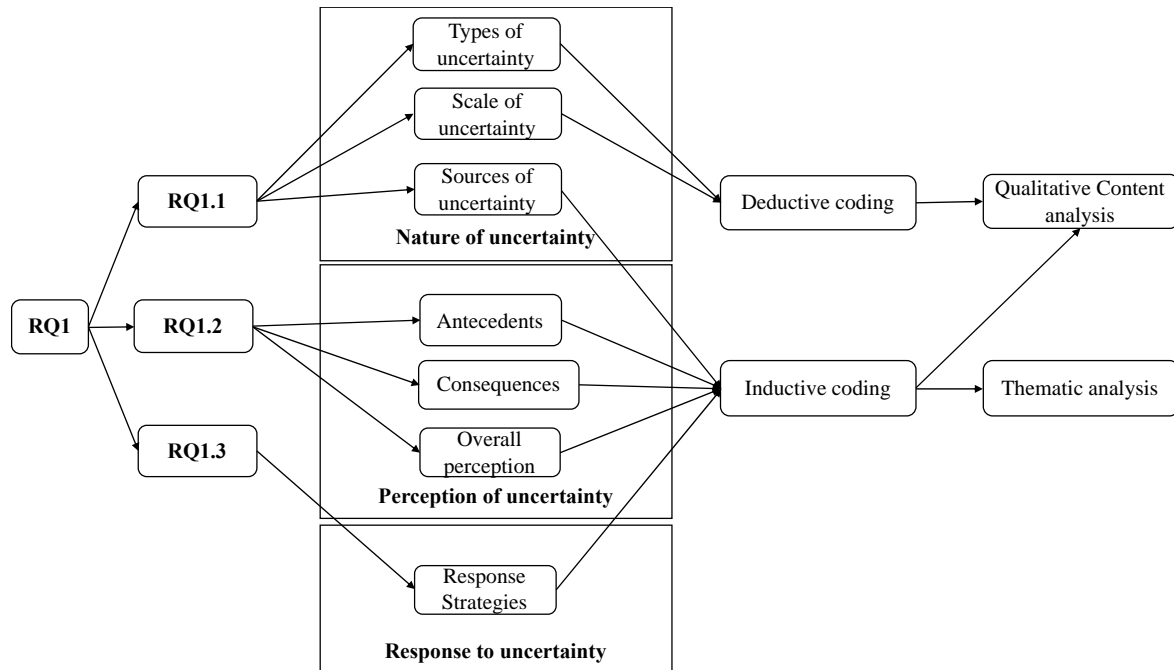
The interview schedule verification process comprised of two stages – general sense and operation and then explicitly applied to finance. The first stage was introduced to fine-tune the interview schedule and to maximise the time spent with the professionals in gathering relevant information. The interview schedule was first piloted with five PhD students from the Open University working on technology enhanced learning. As the objective of this step was to check for clarity and flow of interview questions, the pilot participants did not need to possess domain specific expertise. They highlighted a critical aspect of the interview schedule. As the questions were mainly structured around the examples of uncertainty situations chosen by the interviewee, it was important that they had enough time to think and come up with suitable examples. In the first three interviews, the pilot participants were not given any prior notice about thinking of uncertainty situations that they have encountered. Hence their responses to the questions about the antecedents and consequences of the uncertainty were vague. Based on the initial feedback from the pilot participants, for the remaining two pilot interviews, an email was sent one day before the interview, asking the participants to think about a few examples of uncertainty that they have experienced in their work life. This decision significantly improved the cognitive recall of the pilot participants during the interview. They also reported a higher degree of satisfaction with the interview questions. This exercise helped in improving the methodological rigour in the research approach and instrument.

A second stage of the pilot was carried out with the Senior Adviser at CISI, who has more than forty-seven years of experience in the finance industry and an excellent working knowledge of the cohort of interviewees. He served as the CISI gatekeeper. The interview schedule was piloted with him to ensure clarity and validity of questions from the viewpoint of finance professionals. His feedback ensured that participants would find the questions relevant to their work and accurate terms were used. The only change that was suggested after the pilot interview was to make a clear distinction between the words risk, uncertainty, and volatility. In some of the questions, these words were being used interchangeably, and the gatekeeper warned that this might lead to confusion as volatility and uncertainty had very distinct meanings in the finance sector. Thus, all the questions were changed to use only the word 'uncertainty'.

Seven interviews were conducted face-to-face in London at the interviewees' offices, one was by telephone, and one was on Skype. All the interviews were recorded on a voice recorder and transcribed by the researcher using NVivo 12 software (Woolf & Silver, 2017). NVivo 12 was also used in the coding and analysis phase.

### 4.2.3 Data Analysis

The nature of research questions addressed in this study called for varying approaches in coding and data analysis methods. **Figure 4.3** shows a diagrammatic representation of the various analytical strategies employed in the analysis phase. Types of coding (**Section 4.2.3.1**) and analysis steps for thematic analysis (**Section 4.2.3.2**) and qualitative content analysis (QCA) (**Section 4.2.3.3**) are discussed in subsequent sections.



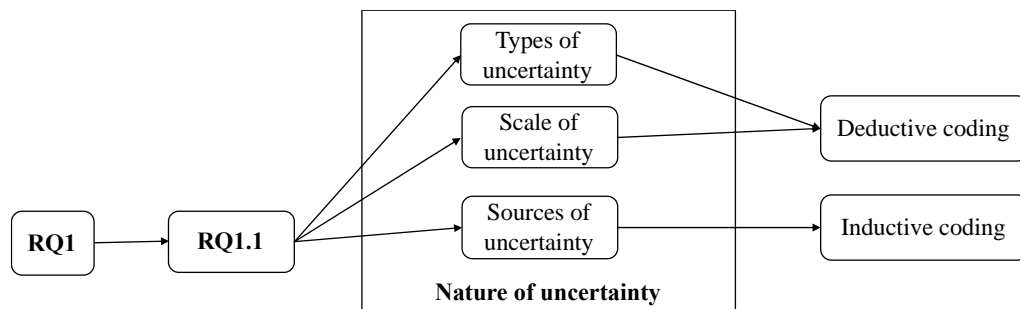
**Figure 4.3: Analytical strategies used for answering RQ1**

As explained in section 4.1, the objective of RQ1 was to examine the nature of uncertainties within the finance sector and the perceptions of finance professionals about these uncertainties. RQ1.1 examined the nature of uncertainties within the finance sector. These were the objective environmental factors that served as sources of uncertainties within the sector. Within RQ1.1, there were three aspects for determining the nature of uncertainty- 1) types of uncertainty; 2) scale of uncertainty; and 3) sources of uncertainty. Types of uncertainty and scale of uncertainty were coded deductively followed by qualitative content analysis, whereas sources of uncertainty were coded inductively, and, in this case, thematic analysis was used (**see Section 4.2.3.1**). RQ1.2 examined the perception of uncertainty. This was categorised as antecedents, consequences, and overall perception of uncertainty. The themes for all three categories were inductively coded, and they were thematically analysed. RQ1.3 examined the response strategies to uncertainty, which were inductively coded and thematically analysed.

#### 4.2.3.1 Coding

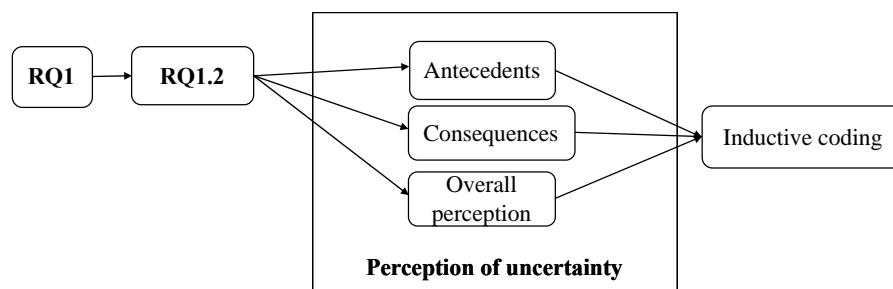
In qualitative research, coding is a process of identifying, defining, and structuring the data such that it enables one to make sense of the underlying data and find relationships between concepts. Thus, a code can be defined as, “a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data” (Saldaña, 2013). There are two distinct approaches to coding – Inductive coding and deductive coding (Linneberg & Korsgaard, 2019). Inductive coding refers to the process in which the researcher interprets the raw data and organises it according to conceptually linking concepts, themes, or models. The inductive coding approach is data-driven, and no a priori assumptions are made regarding the presence of specific concepts. Conversely, deductive coding approach is theory or framework driven. This involves superimposing a pre-existing framework on the underlying interview data to identify instances of data that fit the description of the concepts in the framework.

**RQ1.1** examined the nature of uncertainties in the finance sector. Uncertainty in any sector consists of two aspects - types of perceived uncertainty (PEU) and objective environmental uncertainty. Milliken’s (1987) framework was used to deductively code the types of uncertainty (state, effect, and response uncertainty). Sources of uncertainty were inductively coded from the examples of uncertainties shared by participants (see **Figure 4.4**).



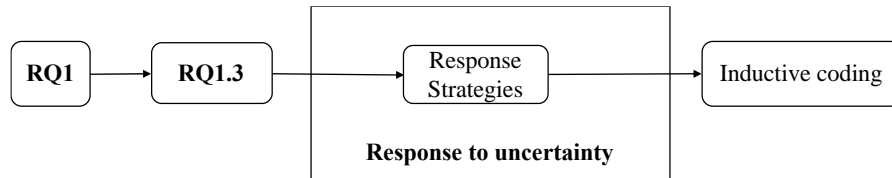
**Figure 4.4: Coding approach for RQ1.1**

**RQ1.2** was concerned with finding the perceived antecedents and consequences to uncertainty. This called for an inductive approach to delve deep into the insights of the participants and engage with the richness of the data (**Figure 4.5**).



**Figure 4.5: Coding approach for RQ1.2**

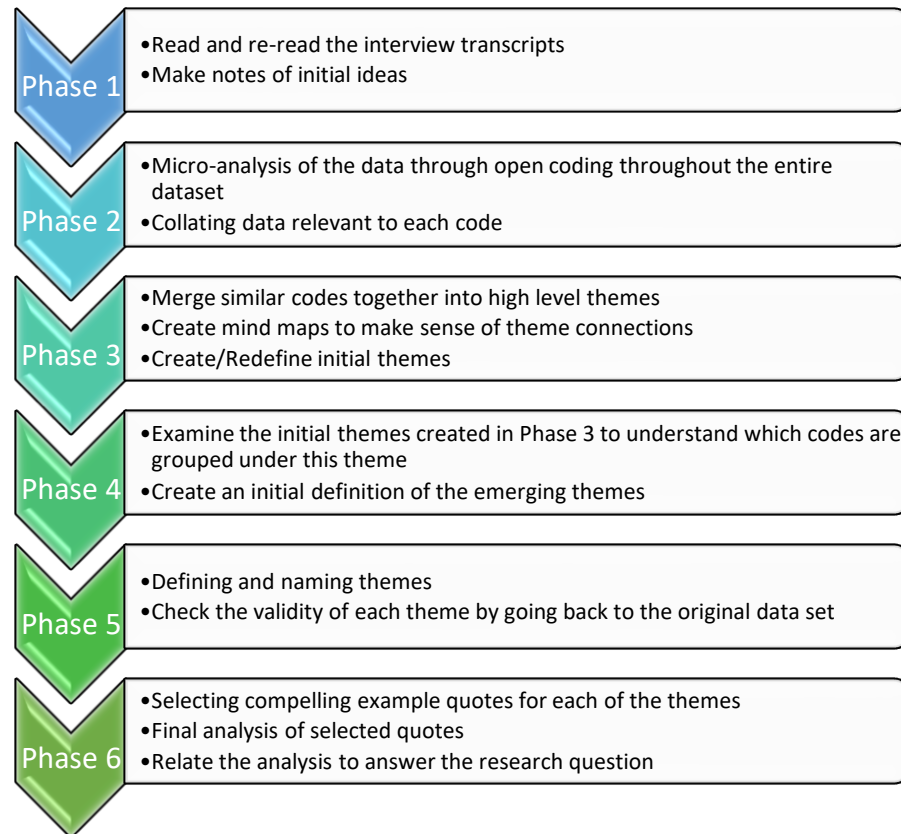
**RQ1.3** examined the strategies used by professionals to deal with periods of uncertainty. Similar to **RQ1.2**, no a priori assumptions were made about how professionals responded to uncertainty. Hence an inductive coding approach was adopted (**Figure 4.6**). Procedures followed for TA (**Section 4.2.3.2**) and QCA (**Section 4.2.3.3**) approaches are explained in the following sub-sections.



**Figure 4.6: Coding approach for RQ1.3**

#### 4.2.3.2 Thematic Analysis (TA)

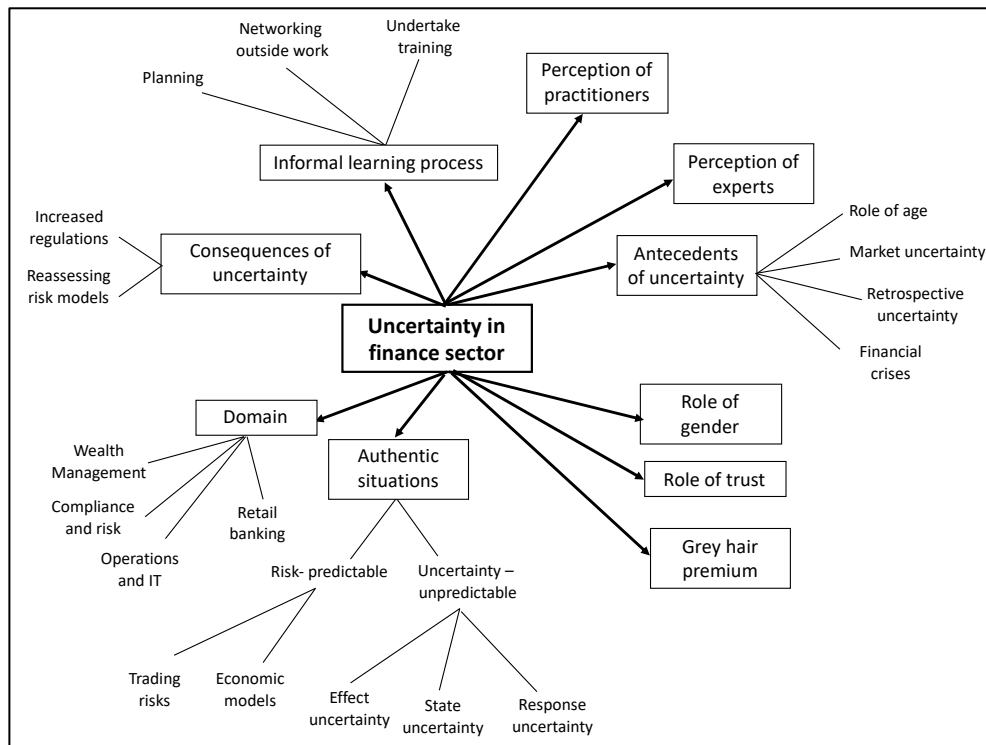
Thematic analysis is one of the commonly used methods in qualitative research that emphasises recognising meaningful patterns in data sets in order to identify underlying themes in qualitative data through the process of coding (Braun & Clarke, 2019). An example of thematic analysis would be the qualitative study carried out by Reardon (2004) studying the impact of organisational change in informal learning of professionals. They conducted nine semi-structured interviews with experienced engineers, asking them to reflect on how they learned to do their job after a significant organisation restructuring. They conducted an inductive thematic analysis to reveal three categories of learning and five limitations of learning. Thematic analysis was deemed appropriate to draw insights about the perceptions of uncertainty from professionals. Braun and Clarke's (2006) thematic analysis method was used to identify themes of sources of uncertainty for RQ1.1. It was also used to ascertain themes regarding antecedents and consequences in RQ1.2 and learning strategies in RQ1.3. Following approach was proposed by Braun and Clark (2006) for conducting a rigorous thematic analysis (**Figure 4.7**):



**Figure 4.7: Phases of thematic analysis (adapted from Braun & Clarke, 2006)**

Although **Figure 4.7** depicts a linear process, in reality it was an iterative process in which the researcher had to go back and forth between the phases.

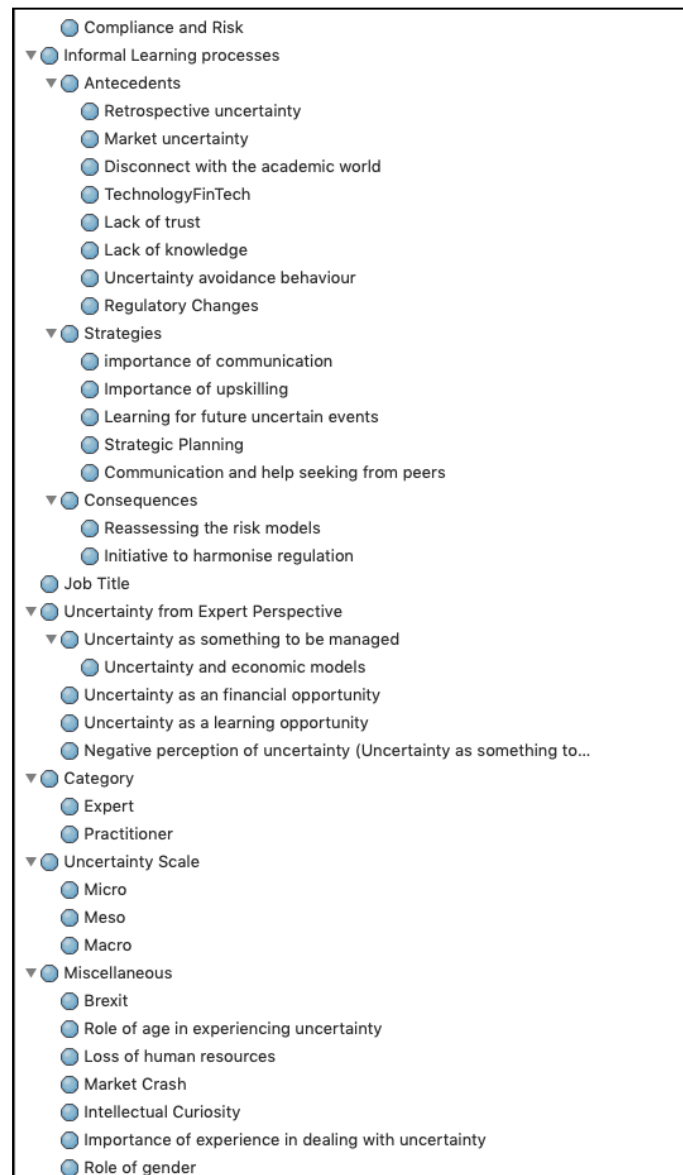
**Phase 1** consisted of reading and re-reading the interview transcripts multiple times. Braun and Clarke (2006) emphasised the importance of this activity for familiarising with the depth and breadth of the data. After going through the entire data set, some emerging themes could be identified. Although NVivo was used for the final stage of coding and analysis, the first phase mainly consisted of annotating the printed interview transcripts with initial ideas on post-it notes. This allowed for the documentation of not just the interesting nuances of the data, but also the researcher's theoretical and reflective thoughts that developed from immersion in the data (Sandelowski, 2001). These notes were useful in the later stages of synthesising the codes into meaningful themes.



**Figure 4.8: Initial codes created in phase 2 of data analysis**

**Phase 2** involved the process of reflecting and interacting with the data by generating initial codes (Savage, 2000). Morse and Richards (2002) refer to this phase as the one in which the researcher develops initial ideas about what is going on in the data. The researcher went through each interview transcript, systematically highlighting interesting themes throughout the data set. After going through the entire data set, a mind-map was created (Braun & Clarke, 2006) to visualise how these initial themes fit together (**Figure 4.8**). In order to capture the qualitative richness of the codes, 'in vivo' coding approach was adopted (Saldaña, 2013). This entailed naming the initial themes as per the actual words repeatedly used by the professionals. One example of this was the use of the phrase 'premium on grey hair'. This pointed to the role of experience and knowledge in dealing with uncertainty. In the initial codes, the theme was named as 'grey hair premium'. After the initial mind mapping phase, each transcript was coded in NVivo on the nodes identified from the paper-based exercise.





**Figure 4.9: Themes created in phase 3 after collating the initial codes for Study 1**

**Phase 3** began when all the data was coded and was ready to be collated into themes. Braun and Clarke (2006) assert that a theme is not necessarily a quantifiable measure but something that highlights an important aspect of the overall research question. After collating the codes into broad themes, a mind map was created (**Figure 4.9**).

**Phase 4** consisted of reviewing the themes identified in Phase 3 in order to ensure their validity. This meant checking that they reflect the meaning of what is being implied throughout the data set (Braun and Clarke, 2006). There were certain codes that did not appear consistently throughout the data set and were subsequently not used for further analysis. For example, – 'Role of age' and 'role of gender' were mentioned a couple of times by 2 professionals, but they did not appear anywhere else in the data. The times that they were mentioned, there was nothing significant that could impact the answers to the research questions. Hence, they were excluded from further analysis.

**Phase 5** involved formalising the names for each theme and writing up detailed descriptions to explicate the aspects of data that were being captured by them (Braun and Clarke, 2006).

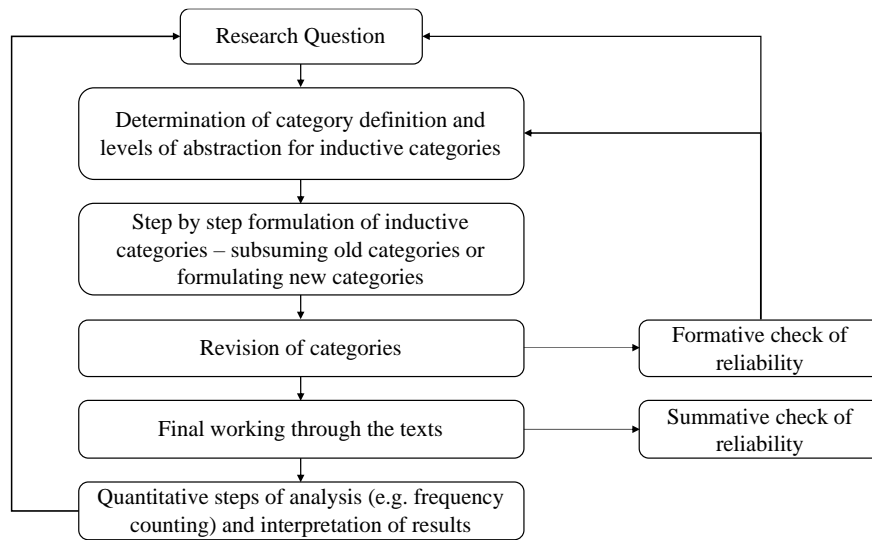
**Phase 6** included checking if the themes related to the research questions. Since the research questions were quite broad in their scope, all the identified themes aligned with at least one of the concepts of perceptions of uncertainty, antecedents, consequences, or strategies to deal with uncertainty. During this phase, the researcher went back to the data to check if the final themes matched the data. The final analysis and write-up were undertaken in the data analysis process. Extracts from raw data that were representative of the theme were chosen to build a more robust and valid narrative. (Braun & Clarke, 2006). Articulation of what a theme means, its underpinning assumptions and its implications for answering the broader research questions were included in the reporting.

#### **4.2.3.3 Qualitative content analysis (QCA)**

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Content analysis has its roots in the positivist paradigm (Berelson, 1952), but recent substantial changes in the field are exploring its applications in the interpretivist qualitative paradigm (Vaismoradi & Snelgrove, 2019). Graneheim et al. (2017) advocate the applications of content analysis in qualitative studies. Qualitative content analysis (QCA) encompasses both inductive and deductive methodological approaches (Mayring, 2014). Inductive content analysis is data-driven (Schreier, 2014). Hence it is used in research that looks for patterns in data in terms of similarities and differences in themes. An example of inductive content analysis would be a study by Thisted et al. (2020) examining the attitudes of employers in managing depression as a workplace issue. They used the inductive content analysis approach to analyse five semi-structured interviews with employers and came up with four emergent themes depicting the attitudes of employers in supporting employees with depression. Deductive content analysis is concept-driven (Schreier, 2014). For example, Hetzner et al. (2009), in their qualitative study at a German retail bank, conducted ten semi-structured interviews with client advisors. They adopted a qualitative content analysis approach using Billett's (2006) framework of workplace changes to investigate employee's perception of change at their workplace, the learning strategies they employed, and the factors fostering or limiting their learning during change.

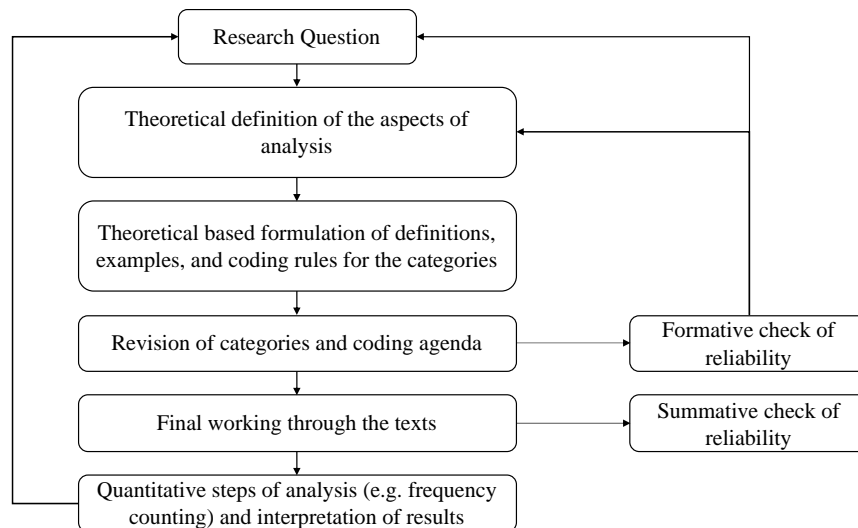
In-line with its usage in the literature for analysing workplace changes, both inductive and deductive approaches to qualitative content analysis, were adopted to analyse the data for RQ1 (as depicted in **Figure 4.3**). Mayring's (2000) step model for inductive (**Figure 4.10**) and deductive (**Figure 4.11**) category development was employed for conducting QCA.



**Figure 4.10: Step model of inductive category development for QCA (from Mayring (2000), para.11)**

Section 4.2.3.1 has already detailed the coding approaches taken for RQ1.1 (Figure 4.4), RQ1.2 (Figure 4.5), and RQ1.3 (Figure 4.6). QCA using inductive category development was carried out to analyse:

- Sources of uncertainty in RQ1.1
- Antecedents, consequences, and overall perception in RQ1.2
- Response strategies in RQ1.3



**Figure 4.11: Step model of deductive category application for QCA (from Mayring (2000), para.14)**

QCA using deductive category development was carried out to analyse RQ1.1:

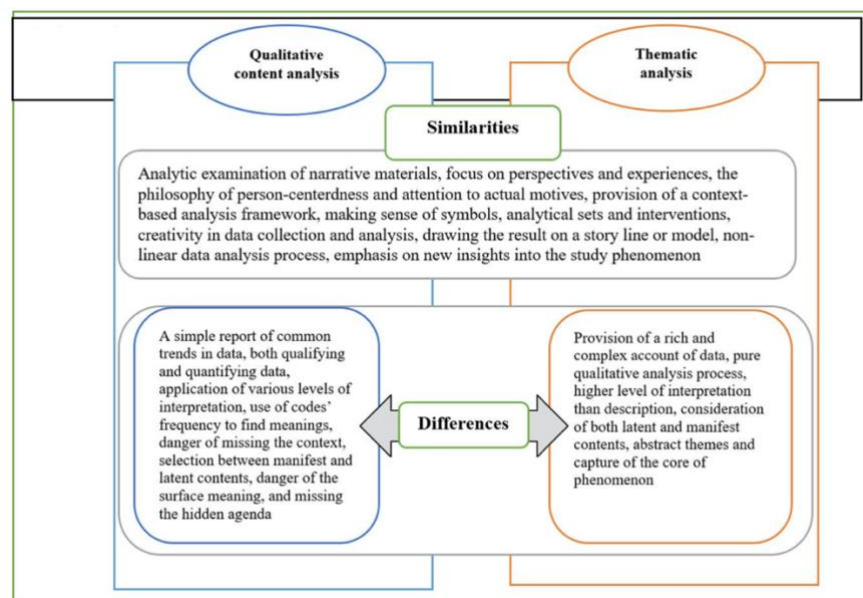
- Types of uncertainty
- Scale of uncertainty

For both inductive and deductive categories, QCA was carried out using frequency counting method, where every instance of an example of uncertainty was counted as one. As explained in **Section 4.2.3.2**, initially, all interviews were inductively and deductively coded. In the second level of coding, once the themes were finalised, frequency counting was undertaken.

#### 4.2.3.4 Combining QCA and TA

In this study, both qualitative content analysis and thematic analysis methods were combined to answer the research questions. For example, sources of uncertainty were analysed using both QCA and TA. Counting the frequencies using QCA allowed for reporting commonalities and differences in perspectives of experts and practitioners, while TA allowed for rich and nuanced descriptions of the sources of uncertainties. Vaismoradi and Snelgrove (2019) cite various similarities between QCA and TA, such as; 1) Common philosophical perspectives and; 2) Context-based iterative framework of analysis that encourages following a systematic and methodical approach, increasing the trustworthiness and validity of findings. Such similarities make it possible for them to be combined in a study. However, there are also specific differences between the two analytical methods. While QCA focuses on using code frequency to identify trends in data, there is a trade-off between selecting either 'latent or manifest' themes (Vaismoradi & Snelgrove, 2019). This gap can be covered by using TA, as it focuses on providing a rich account of data, thus considering both latent and manifest themes.

**Figure 4.12** shows the similarities and differences between QCA and TA.



**Figure 4.12: Similarities and differences between QCA and TA (from Vaismoradi & Snelgrove, (2019))**

There were several advantages to using QCA and TA together, as numbers from QCA complemented and enhanced the narrative and improved the transparency of analysis process (Neale et al., 2014; Sandelowski, 2001). It also helped in improving the clarity of findings and succinct

presentation of evidence. Although, it is not without its limitations, as using numbers in qualitative research is criticised for misrepresentation of data and providing misleading findings. Hence, it should be noted that the counts given throughout the findings section is to count the number of times professionals cite a particular uncertainty during the interviews. This enabled the researcher to compare and contrast the perspectives of experts and practitioners. The counts should be considered only from a comparative viewpoint, and no assumption should be made that higher frequency counts mean the theme is more important than the one with lower frequency counts.

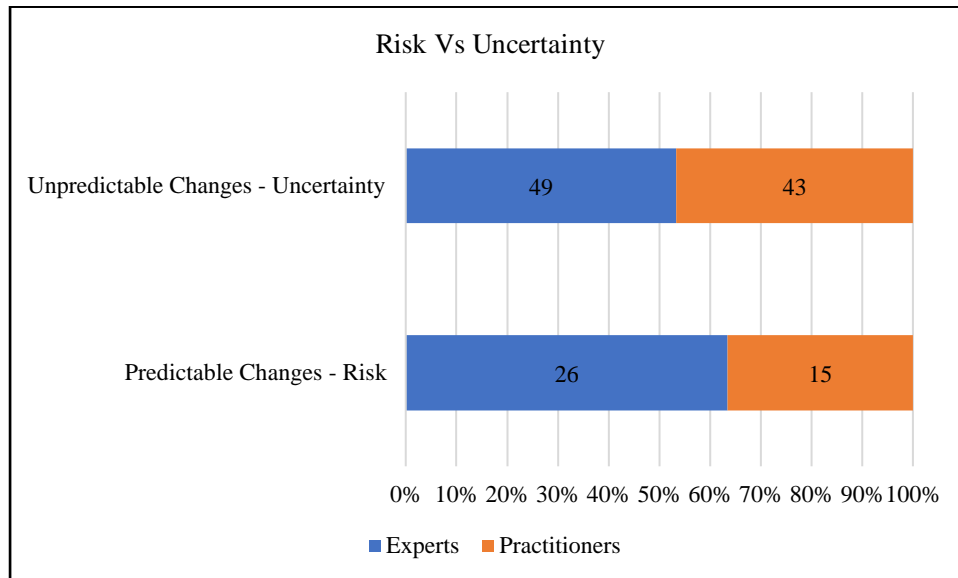
## 4.3 Results

### 4.3.1 Descriptive summary of data

Based on qualitative content analysis, a total of 92 examples of uncertain situations, 41 examples of risk, and 825 codes indicating the antecedents, consequences, and perception of uncertainty were recorded. **Table 4.2** provides a descriptive summary of the categorisation of uncertainty examples according to their type, domain, and the scale of uncertainty.

**Table 4.2: Types of uncertainties reported by finance professionals**

Themes	Codes	Experts	Practitioners	Total
<b>Real Life examples of uncertainty/risk in the finance sector</b>	Predictable Changes – Risk	26	15	41
	Unpredictable Changes – Uncertainty	49	43	92
<b>Type of Uncertainty</b>	State Uncertainty	29	11	40
	Effect Uncertainty	14	15	29
	Response Uncertainty	6	17	23
<b>Finance Domain</b>	Compliance and Risk	40	9	49
	Operations and IT	0	18	18
	Retail Banking	31	27	58
	Wealth Management	4	4	8
<b>Scale of Uncertainty</b>	Macro	38	6	44
	Meso	9	4	13
	Micro	2	33	35



**Figure 4.13: Examples of Risk vs Uncertainty**

A total of 133 real life examples were provided by the professionals. They were analysed to separate out the situations of risk from situations of uncertainty. Risk was defined as predictable changes where probability could be assigned to the market events, and they could be predicted by financial models. 41 situations were found to be examples of risk, and 92 were examples of uncertainty (**Figure 4.13**). To illustrate the difference, following are some of the examples of risk and uncertainty (**Table 4.3**):

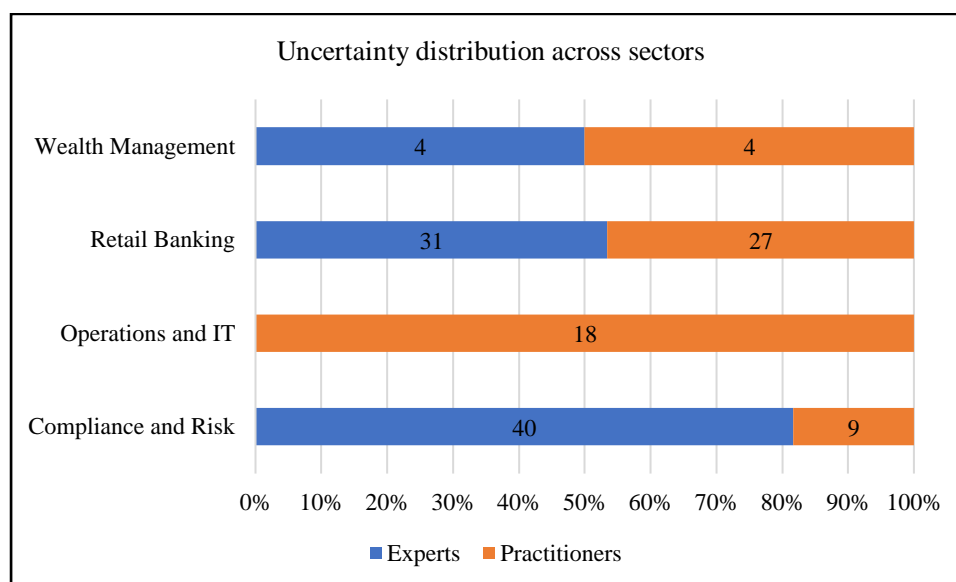
**Table 4.3: Quotes showing differences between risk and uncertainty**

Risk	Uncertainty
‘...for example, in the year 2000: Applying this for example to option pricing on fish stocks in Alaska. And again, if I can reduce the volatility of the stocks, and I find myself in a position where I can say well, I can estimate that mathematically, what is that in reality.’ ( <b>Participant E2</b> )	‘...because people were not quite sure what was happening. How they would go about running their businesses under this completely new culture. In the past it was quite traditional’. ( <b>Participant E5</b> )
‘Look at for example Microsoft or something like that Microsoft effectively would be sort of paid right now to lend money if you look at it they would actually do because they have 100 billion on the balance sheet so they're not going to go away so as a result they don't need to issue that they do however issued it because Treasury management has different liabilities from different countries and cash flows don't	‘I was working in the City of London as a portfolio manager in one of my first jobs when we had the 1987 crash which was one of the least expected of the financial events in the last 50 years at least.’ ( <b>Participant E4</b> )

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always match and it will be a pain to issue debt  
why not do it so here you get a few examples  
like that where there is quite a perverse  
illustration of risk. (**Participant P3**)

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**Figure 4.14: Distribution of uncertainty examples based on domain**

The highest number of uncertainties were reported from the Retail Banking domain (44%), with a close second being the Compliance and Risk domain (37%). There were 13% uncertainties reported from the Operations and IT domain, while only 6% of the total were from Wealth Management domain (**Figure 4.14**). Despite the measures taken during participant selection to ensure an optimum balance between experts and practitioners from each of the domain, there were substantial differences in the types of uncertainties reported. This categorisation was done to provide a summary view of participants and the sector that they represented. As the study focus was to look at PEU of finance professionals during uncertainty, the domain was not considered as a major factor. Hence this categorisation was not used in further analysis.

**Table 4.4: Finance professionals' perspective of uncertainty**

Code	Number of statements coded	% of total statements	Number of participants coded	Experts (n = 5)	Practitioners (n = 4)
<b>Antecedents to Uncertainty</b>	279	31.67%	9	171	108
Lack of Communication	47	5.33%	8	29	18
Lack of Knowledge	48	5.45%	9	32	16
Lack of Trust	35	3.97%	7	26	9
Market Uncertainty	70	7.95%	9	37	33
Role of Technology	58	6.58%	9	32	26
Disconnect with the Academic world	21	2.38%	6	15	6
<b>Consequences of Uncertainty</b>	186	21.11%	9	91	95
Market Crash	32	3.63%	9	19	13
Regulatory Changes	73	8.29%	9	47	26
Changes in training requirement	28	3.18%	7	6	22
Loss of Trust	18	2.04%	5	5	13
Loss of human resources	13	1.48%	4	0	11
Reassessment of the risk models	22	2.50%	8	12	10
<b>Learning Strategies</b>	273	30.99%	9	159	114
Importance of communication	44	4.99%	9	27	17
Importance of upskilling	48	5.45%	9	23	25
Strategic Planning	52	5.90%	6	41	11
Intellectual Curiosity	35	3.97%	4	3	1
Networking/Help seeking from peers/experts	55	6.24%	9	18	37
Importance of experience in dealing with uncertainty	17	1.93%	4	12	5
<b>Perception of Uncertainty</b>	143	16.23%	9	66	77
Uncertainty as a financial opportunity	39	4.43%	9	22	17



Uncertainty as a learning opportunity	49	5.56%	9	31	18
Uncertainty as something to be managed	45	5.11%	5	10	35
Uncertainty as something to be avoided (negative perception)	10	1.14%	4	3	7

**Table 4.4** gives a descriptive summary of themes and sub-themes depicted in order to outline whether there are any differences between experts and practitioners in terms of quantity of statements for each code. The ‘antecedents to the uncertainty’ theme was the most highly discussed by the professionals comprising of 31.67% of the codes (n = 279). The experts contributed 171 codes while the practitioners contributed only 108. The second largest theme was ‘learning strategies’ constituting 30.99% of the coded items (n = 273), of which 159 were from experts and 114 from practitioners. Codes indicating ‘consequences of uncertainty’ formed 21.11% of the discussion (n = 186) which came almost equally from both experts (n=91) and practitioners (n=95). ‘Perception of uncertainty’ theme was 16.23% of coded items (n = 143) of which 66 came from experts and 77 from practitioners.

In the subsequent sections, each of the research questions is answered based on both QCA and TA. While coding, it was clear that there were some similarities and distinct differences in the way experts perceived uncertainty from that of practitioners. Hence, in each of these RQs, the findings are presented in the form of commonalities and differences.

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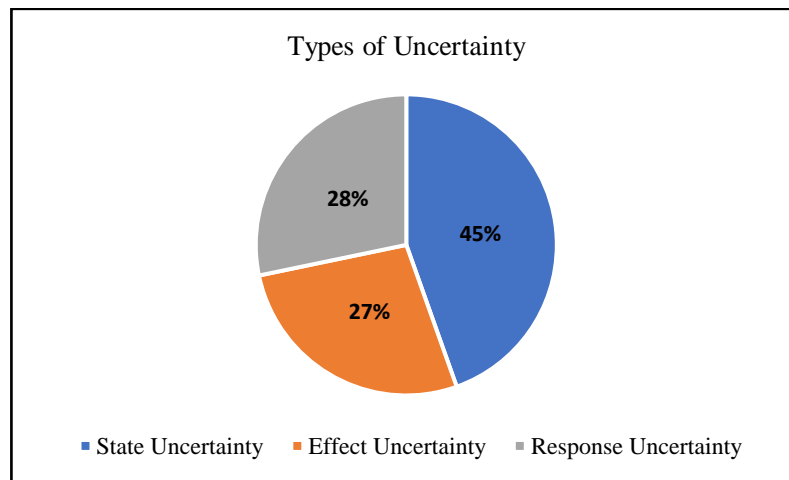
#### 4.3.2 RQ 1.1 – What is the nature of uncertainties perceived by finance professionals?

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RQ 1.1 examines the nature of uncertainties perceived by finance professionals. As explained in **Section 4.2.3**, this question was answered through multiple aspects such as type of uncertainty, scale of uncertainty, and sources of uncertainty.

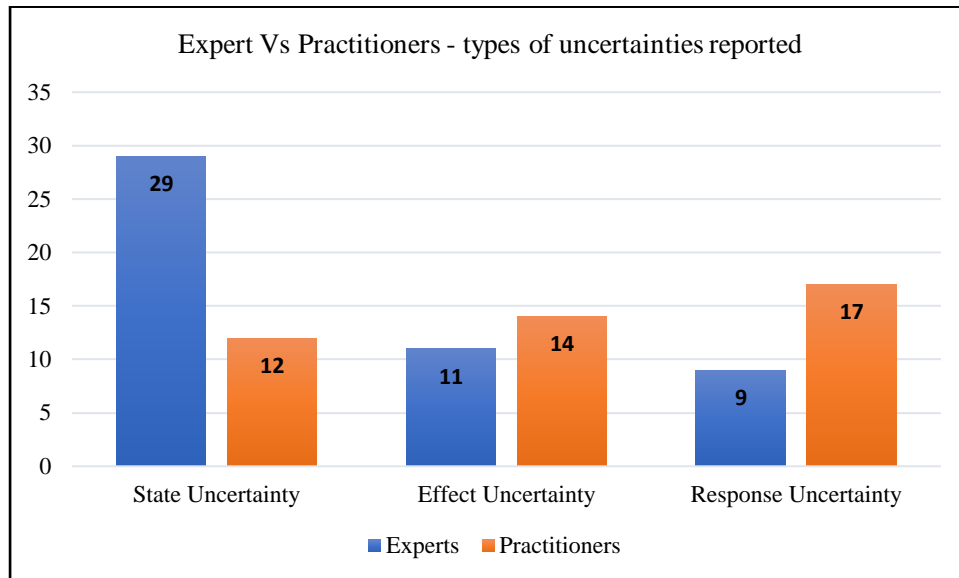
##### Type of uncertainties

Milliken's (1987) framework was used to deductively code the type of uncertainties, as per the definitions of state, effect, and response uncertainty. **Figure 4.15** gives percentage distribution of the types of uncertainties reported by the professionals and **Figure 4.16** shows the split between experts and practitioners in terms of the types of uncertainties reported.



**Figure 4.15: Types of Uncertainty**

Of the uncertainty examples, 45% of the instances were about state uncertainty (when the professionals perceived the state of their work environment/economy to be unpredictable), 27% of them were related to effect uncertainty (when the professionals were unable to predict the impact of a future state of the environment on their work practices/organisation), and 28% were response uncertainty (when the professionals were unable to predict the response choices available to them or the likely consequences of their response choices on their work practices/organisation) (**Figure 4.15**).

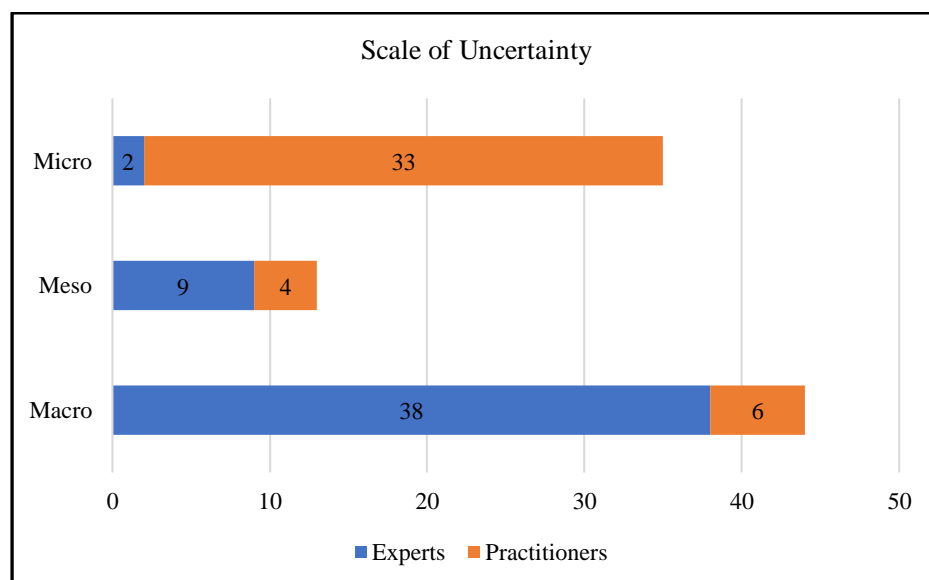


**Figure 4.16: Expert Vs Practitioners - types of uncertainties reported**

Comparison of uncertainties cited by experts and practitioners showed that experts were more likely to cite an example of state uncertainty which they may or may not have experienced first-hand, while practitioners were more likely to report lived experiences of response uncertainty (**Figure 4.16**)

### Scale of Uncertainty

In order to determine the scale, all the examples of uncertainties were inductively coded based on the level of impact the uncertainty had. **Figure 4.17** depicts the graphical distribution of the scale of uncertainties reported by the professionals. It also shows the split between experts and practitioners.



**Figure 4.17: Scale of uncertainty – Experts Vs Practitioners**

**Figure 4.17** shows that practitioners were more likely to report examples of uncertainty at an organisational or individual level (micro) while experts were more likely to report inter-organisational

(meso) or national and global level (macro) uncertainties. Of the 44 examples of macro-level uncertainties, only 6 were reported by practitioners, while 38 were reported by experts. There were 13 examples of meso-level uncertainties with 9 from experts and 4 from practitioners. Out of 35 examples of micro uncertainties, 33 of them were from practitioners, while only 2 were from experts.

### **Sources of uncertainty**

Thematic analysis was carried out after multiple levels of coding to reveal the sources of uncertainties in the finance sector. First, the inductive coding schema was analysed for specific examples of uncertainties mentioned by experts and professionals. From this emerged a second-order thematic scheme, first by adding the number of times a particular uncertain event was described in an interview and then grouping these uncertain events with similar characteristics (**Table 4.5**)

**Table 4.5: Sources of uncertainties in the finance sector and its categorisation**

<b>Themes - Sources of Uncertainty</b>	<b>Definition</b>	<b>Codes - Examples</b>	<b>Expert</b>	<b>Practitioner</b>	<b>Total</b>
Financial Crises	Critical event or point of decision which, if not handled in an appropriate and timely manner (or if not handled at all), may turn into a disaster or catastrophe.	Financial Crisis 2008, Market Crash 1987, UK 1976 IMF crisis, Dot-com bubble, Black Monday, European debt crisis, Northern rock crisis	17	8	25
Structural Changes	Deep reaching change that alters the way authority, capital, information, and responsibility flows in an organisation.	Restructuring a bank, relocation of business, capitalisation and regulation of a bank, organisation takeover, Org restructure	11	7	18
Environmental influences	An identifiable element in the physical, cultural, demographic, environment that affects the survival, operations, and growth of an organisation.	Bird Flu, Avian Flu, Chernobyl, 9/11	3	1	4
Political Decisions	An identifiable element in the political and regulatory environment that affects the survival, operations, and growth of an organisation.	Brexit, Regulations, Monetary Policy, Diplomacy, Sanctions, Basel 3 reforms, Basel 4 reforms, MiFID II directive	31	6	37
Technological Development	An identifiable element in the technological environment that affects the survival, operations, and growth of an organisation.	Hardware, Software/Internet, Robo-advice, crypto-currency	4	4	8

As outlined in the interview schedule (**Appendix 6 and 7**), professionals were asked to give examples about the uncertainties that they faced in their careers or have experienced within the financial sector. One particular thing noticed during the interviews was that when asked about examples of uncertainty, they almost always talked about uncertainty in relation to risk. For example, Participant E5 described an uncertainty situation at stock exchange as a 'long tailed risk'. He elaborated that,

.... well you get a standard deviation of risks and people understand that. That is the risk a senior manager has but when you go beyond two or three standard deviations then the way the tail behaves is totally unpredictable, and that's where uncertainty arrives. (**Participant E5**)

Similar, **Participant E2** clarified the distinction between 'Knightian risk' and 'Knightian uncertainty' with an example of the 'investment banks and their recent decisions'. He said that:

The banks regarded themselves to be operating under 'Knightian risk' where they could rely on their models to calculate the odds. However, when they found that their models are not always completely accurate, they realised that they might be in fact operating under 'Knightian Uncertainty', and hence slowed down on making trades or providing capital, thus slowing the economy. (**Participant E2**)

There was a thin line distinguishing risk from uncertainty. However, since the focus of this research was on uncertainty, the researcher tried to elicit additional information about specific details of a situation, in order to make inferences if the example was that of uncertainty or risk. Based on the examples provided for uncertainty situations the following five themes were identified from the data using thematic analysis.

### **Financial Crises –**

This was one of the most recurring themes in the data. Of the 92 examples of uncertainty, 25 of them were related to financial crises. It consisted of examples of situations where there was a loss of financial assets leading to a liquidity crisis, fall of businesses, or sovereign default. These were critical events or points of decision, which if not handled in an appropriate and timely manner had the potential to turn into a financial disaster such as a market crash or bankruptcy. During the interviews, both experts and practitioners gave various examples which would fall under this category. One of the examples that were mentioned multiple times was the Northern Rock crisis (2008) which was a 'major funding problem at the country's fifth largest mortgage lender that triggered the first run<sup>5</sup> on a British

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<sup>5</sup> Refers to 'Bank Run', which occurs when a large number of customers withdraw their cash from a bank due to the fear of the bank closing down.

bank in more than a century' (**Participant E4**). Similarly, a few other examples that were mentioned were market crash in 1987, the UK 1976 IMF crisis, and the financial crisis of 2008.

### **Structural Changes –**

This theme referred to instances of changes within organisations or economies in response to the post-crisis market environment and changes to regulatory frameworks. It was the third most recurring theme, with 18 examples out of 92. There were many examples given both by practitioners as well as experts when they experienced uncertainty due to internal organisational changes. It also included examples of organisational changes that happened within the markets. For example, in the 1990s, when the process of centralising was introduced in major trading centres, 'trading operations being moved to Frankfurt was considered a major uncertainty' (**Participant P2**). Some of the other structural changes that were mentioned by professionals were bank restructuring, relocations of their businesses, and regulation of the bank in response to the financial crises.

### **Environmental Influences –**

This theme included examples of uncertainties caused due to environmental factors such as epidemics or pandemics, or any other natural or human-made calamities that directly impact the market. Environmental influences were defined as identifiable elements in the physical, cultural, and demographic environment that impacted the survival, operations, and growth of the organisation. Some of the examples cited were bird flu/ avian flu (2005), Chernobyl (1986), and 9/11 (2001) attack which could not have been predicted but had an impact on the market. Although there were very few examples of environmental influences in comparison to financial crisis and structural changes, this was regarded as an important theme, because even though these examples were 'far and few.... but had the potential to have much larger impact on the sector' (**Participant E3**). Hence it was identified as an important theme in the sources of uncertainties.

### **Political Decisions –**

This theme refers to the uncertainty introduced into the system because of political directives or government-mandated regulatory changes, that had the potential to impact the survival, operation, or growth of an organisation. As the interviews were carried out during one of the most uncertain periods in the country triggered by Brexit, it was one of the most cited examples of uncertainties by the professionals (cited 14 times). The theme of political decisions, however, was not just restricted to Brexit, but also included regulatory changes introduced by the government, changes in monetary policy, diplomatic issues, and sanctions. Within this theme, an interesting observation was the substantial differences between the experts and practitioners in the way they perceived Brexit. Experts were more likely to cite it as an example of uncertainty as compared to practitioners. Out of the 14 times that it was cited, 12 times was by experts and 2 times by practitioners.

### **Technological Development –**

The theme of technological development was defined as an identifiable element in the technological environment that had the potential to impact the survival, operations, and growth of an organisation. During the discussion, professionals cited examples of innovations in financial technology that impacted their scope of work. One such example was that of fintech start-ups offering robo-advice for managing investments online, which was seen as a direct threat. Although technology development was mentioned during the interviews only a few times, it was clearly articulated that fintech disruption had the potential to introduce uncertainty for finance professionals in the future. Hence it was included as one of the major sources of uncertainty.

### **Commonalities and differences in perception of uncertainty sources between experts and practitioners**

There was a common alignment between experts and practitioners in perceiving structural changes, environmental influences, and technological developments as the key factors that impact the sector. However, they provided different perspectives for the same theme. For example, while talking about uncertainty introduced by organisational closures, experts talked about the macro impact of the uncertainty sharing an 'outside-in' perspective:

Ya, I wasn't a practitioner. I was at the trade association at the time. So, we were able to see how different firms were impacted by uncertainty like that. And you know, equally another example is when (xxxx -redacted) went out of business a lot of their affiliates went of business as well, except for the London affiliates, which was fully regulated and fully capitalised.

**(Participant E1)**

Conversely, practitioners talked about the operational challenges faced in managing the uncertainty introduced by structural changes:

Ok, so I was involved in restructuring of the largest bank in (xxxx- redacted). As we supervised it more and more, we realised that there are a lot of problems, and these problems probably cannot be overcome as the management was reluctant. Because you try to give suggestions, then you try to persuade, then you try to enforce, but there is some reluctance, because they will be politically well connected. And you have to make a decision, if you want to revoke the license. But the consequence is just unpredictable. **(Participant P3)**

During the interviews, two major differences were identified in the way professionals talked about the sources of uncertainty. The first was the uncertainty introduced by political decisions. Within this theme, Brexit was mentioned multiple times by experts as a source of uncertainty. Experts had both positive as well as negative perceptions about Brexit. As **Participant E1** mentioned, 'Brexit was a predictable uncertainty. Lots of companies managed it perfectly well because they had already



allowed for it, they were prepared for it', positively talking about Brexit. While **Participant E3**, had an opposite view, stating that 'Britain went for Brexit, and there will be a recession tomorrow morning'.

On the contrary, practitioners did not talk about Brexit or any other political decisions as a major source of uncertainty. In a few instances, when practitioners mentioned Brexit, it was more at an individual level of uncertainty related to job relocation or job insecurity. As **Participant P2** called it the 'elephant in the room', stating that 'well people thinking, is my job going to be moved overseas?'. Thus, practitioners focused on the micro and meso-level uncertainties and experts mostly talked about the macro level.

### Summary of RQ 1.1

To summarise the findings of RQ 1.1, the nature of uncertainties in the finance sectors were varied in their range and scope. Professionals gave examples of uncertainties at macro (48%), meso (14%), and micro-level (38%). Thematic analysis of these examples revealed five distinct sources of uncertainties: Financial crises (27%), structural changes (20%), environmental influences (4%), political decisions (40%), and technological development (9%). The professionals perceived these objective uncertainties at all the three levels of PEU, as defined by Milliken (1987) – state uncertainty (45%), effect uncertainty (27%), and response uncertainty (28%). How they perceived these uncertainties in terms of their antecedents and consequences (**Section 4.3.3**) and how they responded to those uncertainties (**Section 4.3.4**) will be covered in the subsequent sections.

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#### 4.3.3 RQ1.2 How did finance professionals perceive uncertainty in terms of their antecedents and consequences?

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To answer RQ1.2, there are three aspects to be considered:

- **Antecedents of uncertainty** – events or circumstances that professionals perceived to be preceding a period of environmental uncertainty
- **Consequences of uncertainty** – events or circumstances that professionals perceived to be as a result of an environmental uncertainty
- **Overall perception** – how did the perceptions about potential antecedents and consequences of uncertainty form the overall perception of uncertainty

**Table 4.6** presents the findings from TA and QCA covering the themes for each of the three aspects of RQ1.2 outlined above and the frequency counts for experts and practitioners.

**Table 4.6: QCA and TA findings for RQ1.2**

Aspects	Themes	Definition	Number of codes	
			Exp	Practitioners
Antecedents to Uncertainty	Lack of Communication	Statements indicating that uncertainty arose because there was a dearth of communication	29	18
	Lack of Knowledge	Statements indicating that uncertainty arose because there was a dearth of knowledge	32	16
	Lack of Trust	Statements indicating that uncertainty arose because there was no trust between the individuals /organisations /teams /nations	26	9
	Market Uncertainty	Statements indicating that uncertainty arose because of volatility of the economic market	37	33
	Role of Technology	Statements indicating that advances in the FinTech sector were responsible for instilling uncertainty	32	26
	Disconnect with the Academic world	Statements indicating that the disconnect between academia and practice were responsible for the uncertainty	15	6
Consequences of Uncertainty	Market Crash	Statements indicating that a period of uncertainty was responsible for decline in stock prices and loss of paper wealth	19	13
	Regulatory Changes	Statements indicating that a period of uncertainty was followed by changes in regulations to accommodate the lessons learned from a period of uncertainty	47	26

	Changes in training requirement	Statements indicating the changes in formal training mandated by an organisation following a period of uncertainty	6	22
	Loss of Trust	Statements indicating that lack of trust between individuals/teams/organisations/nations was responsible for the uncertainty	5	13
	Loss of human resources	Statements indicating loss of human resources due to certain uncertainty (e.g. people losing their jobs)	2	11
	Reassessment of the risk models	Statements indicating that the lessons learnt from a period of uncertainty were incorporated into the risk models to be able to convert future uncertainties into risk	12	10
Perception of uncertainty	Uncertainty as a financial opportunity	Statements indicating that the professionals perceive uncertainty as an opportunity to make more money	22	17
	Uncertainty as a learning opportunity	Statements indicating that the professionals perceive uncertainty as an opportunity to learn from	31	18
	Uncertainty as something to be managed	Statements indicating that the professionals perceive uncertainty as something to be managed (not welcomed nor avoided)	10	35
	Uncertainty as something to be avoided (negative perception)	Statements indicating that the professionals perceive uncertainty as something to be avoided	3	7

TA revealed six themes for antecedents to uncertainty - lack of communication, lack of knowledge, lack of trust, market uncertainty, the role of technology, and disconnect with the academic world. Consequences of uncertainty also had six themes these were: market crash, regulatory changes, changes in training requirement, loss of trust, loss of human resources, and reassessment of risk models. Finally, antecedents and consequences came together to form unique perceptions of uncertainties for both experts and practitioners. They perceived uncertainty either as a financial opportunity, or a learning opportunity, or something to be managed or as something to be avoided, which was the only negative perception of uncertainty. There were unique commonalities and differences in each of these themes for the three aspects which will be illustrated in the following subsections:

### **Common themes between experts and practitioners –**

#### **Antecedents to uncertainty**

The most commonly prevalent perception was that the lack of knowledge was the main precursor to uncertainty. This is expected given the definition of uncertainty itself is the state of not knowing. For example, when talking about the MiFID II<sup>6</sup> regulations, **Participant E4** said that:

...with all regulation there is a certain amount of interpretation that a firm has to make. So, it is quite challenging for a firm. I think that is where the uncertainty comes in is in not knowing how to interpret that guidance. (**Participant E4**)

Another theme that was persistently present in all the interviews was the uncertainty caused due to fluctuations in the market. Given that finance professionals have to deal with the highly volatile and ambiguous nature of the economic markets, it was not surprising that market uncertainty was perceived as one of the common antecedents to uncertainty in the workplace. The following two quotes demonstrate how market uncertainty impacted the finance professionals, and why they perceived it as an antecedent to uncertainty:

So, there was a market crash many years ago, which was called the 'Black Monday'. And because so many people had never dealt with an unexpected market crash a lot of people did not know how to handle customers and in many cases, they never experienced such a severe decline in market liquidity. And of course, they couldn't handle customer nuance. So that was one example [of uncertainty] (**Participant E1**)

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<sup>6</sup> MiFID II – Markets in Financial Instruments Directive is the EU legislation that regulates firms who provide services to clients linked to 'financial instruments. MiFID was introduced in the UK in 2007 and was revised to MiFID II in 2018. (<https://www.fca.org.uk/markets/mifid-ii>)

When the Swiss Bank delinked the Swiss Franc from the Euro, not surprisingly the Swiss Franc went hugely north and lots of companies of course who hadn't expected it, and as a result lots of customers lost money and some companies went out of business because it was such a massive market crash that they couldn't handle it. (**Participant E3**)

Additionally, the role of technology was also mentioned by all the participants as being responsible for introducing uncertainty in their workplace. Professionals cited technology as an antecedent to uncertainty in various context. For instance, **Participant E2** cited wealth management advice-giving robots as bringing uncertainty for practitioners. There were also examples of algorithms driving financial decisions that cause uncertainty for professionals, as evidenced in the quote below:

Ya, I mean the other interesting dimension is that it is increasingly becoming a less human problem. So, you know all about the amount of activities being allocated to algorithms. So, people don't adapt perfectly to market conditions, we know that from experience. But what we don't know yet, is particularly how will the algorithms that are taking note of this activity, how they respond to significant event, and how they interact with each other. (**Participant P1**)

Similarly, most of the participants (eight out of the nine) reported lack of communication to be an important factor in increasing the perception of uncertainty amongst professionals. The scale of this lack of communication varied widely from a communication gap between two nations to two or more individuals who were decision-makers. For example, the issue of people working in silos and therefore not always alert to issues external to their work environment was mentioned by one respondent (**Participant E2**). At the same time, another talked of how the issue of a failure of supervisors talking to management highlighted in the report of Northern Rock crisis was something he recognised in his group also (**Participant P3**).

### **Consequences of uncertainty**

Similar to antecedents, there were some common prevalent themes reported by experts and practitioners. For example, all the professionals gave an example of a market crash following a period of economic or political uncertainty. The most commonly cited among those were the UK Sterling IMF (International Monetary Fund) crisis. Reflecting on his experiences of the IMF crisis and immense uncertainty that ensued, **Participant E2** said:

The one that lives in my memory a lot is the U.K. sterling IMF crisis.... And that meant so much speculation with the sterling and we said that we didn't have the cash to pay.... So, we said, how would we do that, because we haven't got a clue, because we haven't done it since the days of exchange control. (**Participant E2**)

Similarly, regulatory changes as a consequence of a period of uncertainty were cited as one of the common consequences of uncertainty by all the professionals. In explaining how Basel I, II, and III regulations came about, **Participant E2** mentioned that 'every piece of uncertainty resulted in unexpected volatility and downside returns, resulted in more and more regulations.' The experts view on consequences of uncertainty was mirrored by the practitioners with additional details about how the regulations imposed as a result of uncertainty had a trickle-down impact on the marketplace, as evidenced by the quote below:

... [a period of uncertainty] subsequently led to a period of key regulation in financial market. And that key regulation resulted in the separation between alpha and beta and the leverage of the both of those, the increase in complex products and hedging products which in turn led to evaluation of risk coming into the marketplace. (**Participant P3**)

Almost all the professionals (eight out of nine) reported reassessment of risk models as a consequence of market uncertainty. This shows that uncertainty was perceived as a learning opportunity, where the lessons learnt from uncertain times were incorporated into the economic models, thus converting future uncertainties into risk. Since the definition of risk is to be able to assign probabilities to events, learning from uncertainty events and feeding that information into the economic models provided data for the future, thus converting the future uncertainties into risk. In relating his experiences of the 1987 market crash, **Participant E5** elaborated on the process of how the uncertainty caused by the crash lead to reassessment of risk models and the impact it had on the market:

...lead people to reassess not only their risk models, but their interpretation of probabilistic estimates and returns and indeed what to do next in terms of asset allocation and so forth and whether any of the previous models worked. From there the response - the policy response of the central banks to effectively cut interest rates led to a period where the market gradually restored faith in financial models and so forth. (**Participant E5**)

## **Perception of uncertainty**

All the professionals perceived uncertainty as a financial opportunity. However, closer investigations of these examples that were cited for uncertainty being a financial opportunity related to the professionals' predisposition to think of uncertainty in terms of risk. For example, Participant E4 rationalised his viewpoint that uncertainty is a financial opportunity with the following argument:

Traditionally uncertainty represents risk and risk has a trade-off through returns. So therefore, traditionally there should be opportunity a function of psychology. But people are not focusing on returns at the moment, they are only fixing on the risks. So that certainly is new - this relationship between risk and return is manifesting itself in the way that it should. I mean,

we got free money basically from Central Banks. Entrepreneurs should be taking that free money and looking for opportunity and we should be growing faster and stronger globally than we actually are. **(Participant E4)**

All the professionals also reported examples of uncertainty where they perceived it as a learning opportunity. These were mostly examples when the organisations/individuals were unsuccessful in managing the uncertainty. This means that when they failed to manage uncertainty, they viewed it as a learning opportunity. The following quote demonstrates an example given by a regulator when they were handling a 'full-blown financial crisis spilling over to the whole economy'.

...we see there is no response from the Central Bank, it is not really the government's issue. So, we start to make up our own rules about - if you want to track short term money, you must put aside so much liquidity, so much capital. These are not really Basel compliant, but this is something we felt that our market needed at that time, because of the specific risk that we faced. And as I said, it was too little too late - we were blamed when the whole thing started to fall apart. But we subsequently learned from this incident. **(Participant P3)**

Although the experts and practitioners shared some common perceptions about antecedents, consequences, and ways in which they perceived uncertainty, they also had some differences which will be discussed in the following section.

## **Differences in perception of experts and practitioners – Antecedents to uncertainty**

A significant difference between the experts and practitioners was that experts believed that lack of trust was an important antecedent to uncertainty. Of the 35 items coded to this theme, 26 were from experts and only 9 were from practitioners. **Participant E5**, who was a senior adviser, recounted how a period of uncertainty brought about the breakdown of trust between buyers of the firm and the employees:

Trust was key and that created a big problem.... So, trust broke down and some bad things happened. I mean people did quite really naughty things about 20-30 years ago which created real uncertainty. Because people, particularly the new buyers of the firms, the American, German and Japanese banks, thought 'what have we bought here? These people are crooks. And this was a problem. **(Participant E5)**

Similarly, disconnect to the academic world was reported as a precursor to uncertainty 15 times out of 21 by experts.

Lack of information is always .... (trails off) and I blame it on our lack of contact with academic world. However, exactly because the academic world knows more about the history and what is happening around the world, and how Lehman used to overcome things. They could have probably suggested earlier that they see bad trends, that in other countries they dealt with in a certain way - like if you do it like this, it doesn't work...but if you do it like this then it might just work. So probably we should have had more contact with the academic research centres. (**Participant E4**)

### **Consequences of uncertainty**

A key difference in the way experts and practitioners perceived antecedents and consequences to uncertainty was that practitioners were more likely to emphasise the consequences of uncertainty, whereas experts emphasised what caused that uncertainty and what they learnt from it. Of the 28 instances of statements coded to the theme of changes in training requirements preceding a period of uncertainty, 22 were made by the practitioners, whereas only 6 of those were from experts. Practitioners called for organisations to be 'more proactive and delivering training and talk about the issues and help people understand better' (**Participant P2**). When asked about the consequences of technological uncertainty in a wealth management organisation, **Participant P4** said:

Yeah, I think some organisations are looking to create their own platforms and train their staff in using those going forward. That is one way to handle the uncertainty. (**Participant P4**)

As previously mentioned, the lack of trust was cited as an antecedent to uncertainty by the experts. Interestingly, practitioners were more likely to perceive it as a consequence that followed the period of uncertainty. Of the 18 statements coded to this theme, 13 were from practitioners whereas only 5 were from experts. **Participant P3**, used the analogy of a family going through crises and how the trust would breakdown if family members don't support each other to depict the loss of trust after a period of uncertainty:

You know like in a family when you are going through a crisis, you and your partner support each other, not become overly safe and say - hmm, there is something wrong with you, I should put you somewhere else. This is the same - in good times maybe the regulator and the market should be on the very opposite ends and in bad times they should probably come together to discuss what are the issues. Unfortunately, there is lot of blame game going on - you did not tell us that there was market over-heating, you should have stopped us before we lent too much. So ya, there are these issues. (**Participant P3**)

One of the critical differences in the perceptions of experts and practitioners was that loss of human resources due to uncertainty was discussed by all the practitioners but was never mentioned by any of



the experts. When talking about the impact on human resources in the context of technological uncertainty in the wealth management sector, **Participant P4** said:

One of the regulations required all investment advisers to have a professional qualification, where historically people have been grandfathered in. And people who had worked for 30-40 years with no financial qualification suddenly had to get a financial qualification. That there was obviously uncertainty within the industry to how many people would leave the industry because of that. (Participant P4)

### **Perception of uncertainty**

Although, both experts and practitioners perceived uncertainty as financial or learning opportunities, some professionals (four out of nine) attached negative connotations to the word 'uncertainty', and as such viewed it as something to be managed or avoided. Practitioners were more likely to report negative perceptions towards uncertainty compared to experts. Of the 10 statements coded to this theme, 7 were from practitioners and only 3 from experts. In response to what professionals typically do when they perceive uncertainty, **Participant P2** said:

They do nothing, they become paralysed. So, you can find that people stop changing their jobs, get worried. That creates a world where internal rates of return projections are not acted on even though they are positive. That means that growth slows down. So that's the mess that we currently are in. (**Participant P2**)

Even in statements made by experts, they talked about the negative impact of uncertainty in the context of practitioners, as evidenced in the quote below, by **Participant E2** as they recounted the reactions of their employees after the 9/11 crises:

So, take for instance the 9/11 example. Even though it happened in the US, it was on the television screens. And everyone in the office was standing around and watching it on the screen, as the planes hit the towers. Now, we had contingencies in place, we had stop losses, and the European markets group but the people were just frozen looking at the screens. So, all the correct procedures - stop losses, this, that and the other - were there but nothing happened. People literally could not respond. So again, the learning experience to me from that was that sometimes doing the calculations alone doesn't resolve the situation. (**Participant E2**)

### **Summary of RQ 1.2**

To summarise, both experts and practitioners agreed that lack of knowledge, technological development, market uncertainties, and lack of communication are factors that inject uncertainty into

their day to day work practices. However, experts were more likely to perceive the absence of trust and disconnect with the academics as factors leading to uncertainty, as compared to practitioners.

All the professionals perceived uncertainty as either a financial or learning opportunity. However, practitioners were more likely to perceive uncertainty as something to be managed or avoided, whereas experts were more inclined to harness the lessons learnt from the uncertainty for future use. There were some similarities and differences in the way experts and practitioners perceived the consequences of uncertainty. Market crash, regulatory changes, and reassessment of risk models were seen as probable consequences of uncertainty by both experts and practitioners. Practitioners were more likely to experience loss of human resources, loss of trust and changes in training requirement as an aftermath of uncertainty as compared to experts.

#### 4.3.4 RQ 1.3 In what ways do finance professionals respond to the periods of uncertainty?

RQ1.3 examined ways in which finance professionals responded to changes in periods of uncertainty. In response to the questions ‘What strategies did you use when dealing with the period of uncertainty? How did you overcome it?’, a range of responses were shared. **Table 4.7** presents the findings from thematic analysis and qualitative content analysis covering the themes for each of the three aspects of RQ1.2 outlined above and the frequency counts for experts and practitioners.

**Table 4.7: QCA and TA findings for RQ1.3**

Aspects	Themes	Definition	Number of statements coded	
			Experts	Practitioners
Learning Strategies	Importance of communication	Statements indicating that the professionals learnt the importance of communication after experiencing uncertainty	27	17
	Importance of upskilling	Statements indicating that the professionals realised the value of upskilling after experiencing uncertainty	23	25
	Initiative to harmonise regulation	Statements indicating that organisations/nations recognised the need to make regulatory changes following a period of uncertainty	17	5
	Strategic Planning	Statements indicating that organisations/individuals	41	11

		recognised the value of strategic planning following a period of uncertainty		
	Intellectual Curiosity	Statements indicating that the individuals recognised the role of intellectual curiosity in managing uncertainty	21	14
	Communication/Help seeking from peers/experts	Statements indicating the value of communication or networking with peers and experts for dealing with uncertainty	18	37
	Importance of experience in dealing with uncertainty	Statements indicating that the professionals recognise the importance of experience in dealing with uncertainty	12	5

Seven themes were identified within the learning strategies: the importance of communication, the importance of upskilling, initiative to harmonise regulation, strategic planning, intellectual curiosity, communication/help-seeking from peers or experts, and importance of experience in dealing with uncertainty. The commonalities and differences in each of these themes will be illustrated in the following subsections:

### **Common themes between experts and practitioners**

Importance of communication was the most recurring theme in this analysis. All the participants mentioned it as the most vital strategy of dealing with uncertainty. It was not just mentioned by all the participants, but it was also related to uncertainties of all types (state, effect, and response uncertainty) and across all the scales (micro, meso, macro). The following experience of employing competent communication skills in reducing a macro-level uncertainty was shared by **Participant 3**:

How we overcame - we had separated financial services authority, Central Bank, and the government. During good times everyone was not very co-operative, but during bad times we managed to make a financial stability council and there were really the people there from the government, the Central bank, and the regulatory authority, and they communicated well. This was, in my opinion probably allowed to somehow unwind the crisis a little bit. (**Participant P3**)

Another important strategy to deal with uncertainty was recognising the importance of upskilling. Both experts and practitioners unanimously agreed on the role of upskilling/training when dealing with uncertainty. The upskilling that professionals mentioned, was not just in terms of domain or technical training, but also in soft skills for managing uncertainty, as evidenced in the following quote:

This is a hard one, because the thing about learning is the reduction of uncertainty. So, a lot of people send people on courses supposedly to reduce it. So, I think there are two different types of learning. There is uncertainty reduction and skills management things like that. These are kinds of what I might call more awareness and alertness and thinking. And two sorts of different modes. **(Participant E4)**

One of the most commonly cited learning strategies was networking and talking to peers/experts when faced with uncertainty, which was mentioned by all nine participants. Even in instances when they were unable to share information due to the competitive nature of the sector, the professionals reported that networking with peers from both within and outside the organisation helped them gain perspective during times of uncertainty.

They try to speak to colleagues, peers and so on. This is people most on the senior level but speaking to peers about what they think is going on. Because there is, well bankers are furiously competitive to each other. There are some things that are outside of their control. So, they are quite unable to share information on that. **(Participant E1)**

The importance of learning to network and seeking help from colleagues also extended to helping professionals make ethical decisions in their work, as evidenced in the quote below from **Participant P2** in the context of conducting ethics seminar at work:

But they tend to really engage especially when it is face-to-face with dilemmas. They really do find it quite useful I think even just having the exercise of talking it through with their peers. Especially our financial planning members, because they tend to work either as a sole trader or in much smaller organisations maybe about 5-6 staff. So, they don't often get the opportunity to really talk through things with peers or colleagues. So, the in-person training is really helpful. If you are talking to a member who works for a large firm, often the answer is: you need to follow their firm's processes, because they will often have processes set out for you to follow. But there are incidents where it is helpful to even just talk it through even with somebody in a professional body and see what the best thing to do in that situation could be. **(Participant P2)**

Despite the strong similarities in learning strategies adopted during times of uncertainty, there were also some differences between the experts and practitioners in the way they perceived learning. These differences are outlined in the next section.

### **Differences in perception of experts and practitioners**

Of the 273 statements coded for the 'learning strategies' theme, 159 were made by experts while 114 were from practitioners. Similar to the 'antecedents to uncertainty' theme, experts were more likely to focus on learning from an uncertain situation as compared to practitioners. Strategic Planning was reported as a learning strategy by most of the experts (four out of five) and half of the practitioners (two out of four). When talking about Brexit uncertainty, **Participant E2** emphasised the importance of strategic planning:

.... if you have the sophistication of knowing that and knowing that the exposures are far in advance then you can be prepared to take advantage or equivalent. (**Participant E2**)

Experts were more likely to cite the importance of showing intellectual curiosity about the factors influencing the uncertain situation, then analysing and learning from them to arrive at educated estimates of what would be the best way forward (four out of nine) as demonstrated by the following two quotes:

I guess that very best professionals try to keep as aware as possible of all the risks that are out there. (**Participant E5**)

People who learn to manage or adapt to uncertainty, are those who have intellectual curiosity. They ask a lot of questions. Ok. They think a lot. They think a lot about things and about the job they are doing. I mean going back to the trader, the perception of that psychologist was, that he was dumb, well he was not dumb. But he was intelligent in a different way. (**Participant E1**)

Experts were also more likely to report the importance of experience in learning from an uncertainty situation (four out of five). Of the 14 statements coded for this theme of 'importance of experience in dealing with uncertainty' 12 were from experts and only 2 from practitioners. Experts believed that experience is the key factor in dealing with uncertainty, as mentioned by Participant E2 when talking about a scenario reporting example:

...But equally somebody with a lot of grey hair can also say - guys shift it faster, I want the limits down. So, I think those kinds of processes are in place but there is still reliance on key people. (**Participant E2**)

The statement made by a practitioner around this theme showed that the practitioners also recognised the importance of experience in dealing with uncertainty, but maybe they were not very vocal about it.

...And you know in those situations people naturally defer to experience, because that's important. And also, people with grey hair know that no matter how bad it is, important thing is to send out very clear messages as to - "mm don't worry, mmm very good, yes done this before, fine. **(Participant P1)**

### Summary of RQ 1.3

RQ 1.3 examined the response strategies exercised by professionals when they were faced by an uncertainty situation. Thematic analysis of the interview data revealed that communication was the key strategy to deal with uncertainty. The importance of communication was expressed by all the professionals, across all types and scales of uncertainty. Also, both experts and practitioners expressed that networking and regularly upskilling themselves were imperative response strategies for dealing with uncertainty. Additionally, experts emphasised the role of strategic planning, practising intellectual curiosity, and realising the importance of experience as possible ways to respond to uncertainty.

## 4.4 Discussion

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In this study, RQ1 examined the nature of uncertainties perceived by finance professionals and their general perceptions towards these uncertainties. This research question was answered in three parts. RQ 1.1 examined the sources of uncertainties typically found in the finance sector. RQ 1.2 analysed the antecedent, consequences, and overall perceptions of uncertainties of the finance professionals. RQ 1.3 shed light on the ways in which these perceptions led to strategies that professionals employed for responding to uncertainty.

In **Chapter 2 (Section 2.3)** a research gap was identified in the literature, wherein it was argued that since objective environmental factors were subject to change with time and context (Hertati, 2015), it is first important to establish the objective sources of environmental uncertainties within the sector. The findings from RQ1.1 addresses this gap identified in **Chapter 2 (Section 2.3)**. Financial crises, structural changes, political decisions, market uncertainty, and technological development were identified as the key factors introducing objective environmental uncertainty into the sector.

Lack of communication and disconnect with the academic world were reported as the key antecedents to uncertainty. This is in conformance with the findings from Novin et al.'s (1997) study that identified the need for more effective communication and interaction between educators and practitioners. 'Trust' was yet another significant theme mentioned by seven out of nine professionals, in relation to the antecedent of uncertainty. Research within the change management literature has

emphasised the role of communication and trust linked to the professionals' perceived uncertainty during turbulent times (Arnaout & Esposito, 2018; Garcia & Gluesing, 2013; Allen et al., 2007). Typically, loss of trust was seen as a consequence of perceived uncertainty (Allen et al., 2007), whereas lack of communication was found to be an antecedent of perceived uncertainty (Arnaout & Esposito, 2018; Garcia & Gluesing, 2013). The findings from this study are in-line with the previous studies with regards to the lack of communication being an antecedent of perceived uncertainty. However, it differs from the earlier findings, as lack of trust was also noted as a potential antecedent to uncertainty along with being a consequence of uncertainty.

Another significant contribution of this study to the existing literature is the comparison between the perceptions of experts versus practitioners. This comparison revealed that experts were more likely to indicate lack of trust as an antecedent of uncertainty in contrast to practitioners who were more likely to report it as a consequence. Beyond the finance sector, a study carried out by Adobor (2006) in the pharmaceutical and biotechnology industry in the US and Canada, found that certain amount of uncertainty is necessary for the emergence of trust within the dealing parties, however beyond a particular threshold increase in uncertainty leads to a reduction in trust. Findings from this study conform to the findings of Adobor (2006) as practitioners reported the loss of trust as a likely consequence of uncertainty. This finding also adds to the literature on change management, as it highlights the importance of studying the role of trust and communication from multiple perspectives.

An essential finding of this study was that finance professionals did not report high levels of negative perception towards uncertainty. For example, of the total statements coded in this study, only 1.14% of the codes were related to professionals talking about uncertainty negatively. This alludes to the possibility that finance professionals acknowledge and accept the fact that they work in a world of inherent uncertainty and they welcome it as a financial opportunity, or a learning opportunity or even something that they can manage.

In examining the learning aspects of finance professionals during uncertainty, particular attention was given to how professionals perceived it. Uncertainty management literature revolves around two views – 1) Perceiving uncertainty as a threat - coping with uncertainty (Alpers, 2019; Ballesteros & Kunreuther, 2018; J. March & Simon, 1958) and 2) Perceiving uncertainty as an opportunity - managing uncertainty (Allen et al., 2007; Cumming et al., 2019; Mann, 2011; Syrett & Devine, 2012). The findings from this research add to the scholarly work on uncertainty management by suggesting that there might be a third view which is perceiving uncertainty as a learning opportunity. Within the behavioural finance literature, one of the most recurring constructs studied in relation to uncertainty is the decision-making ability of professionals (Fenton-O'Creevy et al., 2011). However, findings from this study allude to the significance of understanding the learning behaviour during uncertainty, as it will be beneficial to the organisations as well as individuals.

Related to this finding was the recurring theme of the importance of learning in uncertainty across all the categories. For example, lack of knowledge and disconnect with the academic world was recognised as a key antecedent to uncertainty. This finding was in line with Lopes's (2010) research investigating the decision-making process in uncertainty. He found learning in uncertainty as a

recurrent theme across all his study participants. In the same research, he had proposed the conceptual framework wherein the central concept of uncertainty is driven by two axes – one is the 'tacit' or objective characteristics of an uncertain context. At the same time, other is the one associated with the learner's "cognitive, communicative and social capacities, which have an impact on him as human being" (p. 253). The findings from this study validate Lopes's (2010) framework, as it found five tacit sources that had the potential to inject uncertainty into the sector on the tacit axis, and perceptions about uncertainty on the subjective axis.

Furthermore, professionals recognised changes in training requirement that followed a period of uncertainty, whether it was objective environmental uncertainty or subjective perceived uncertainty. This means that when the cause of uncertainty was related to any external environmental factors such as regulatory changes or technological changes, changes in the training requirement was mandated by the government or organisations. However, when professionals perceived uncertainty, they responded by investing time and effort in reskilling or upskilling themselves. The findings were in line with Bohlinger et al.'s (2015) research examining workplace learning in uncertainty. They classified the challenges to learning under uncertainty under three levels:

- At the micro (individual) level, the onus is on the professionals to learn to manage continuous change as it is a key qualification for their employability.
- At the meso (organisational) level, the role of organisations is important in empowering their employees to manage uncertainty through upskilling, formal training, support for informal learning opportunities.
- At the macro-level (socio-political) upskilling of the global workforce.

Within the themes for perception of uncertainty, professionals specifically talked about uncertainty as a learning opportunity. As indicated in the literature review most of the empirical studies carried out around uncertainty look at how professionals make decisions (Petratou, 2016) or how they innovate in uncertainty (Freel, 2005) but there is very little focus on how they learn in uncertainty and findings from this study indicate that there is potential for further research.

Known risk can be easily quantified and converted to "known uncertainty"; however, unknown risk is susceptible to measurement (Knight, 1921). Discussions during the interviews revealed that in the real world, all events were so complex that finance professionals were almost always dealing with 'true uncertainty' not risk, which is in line with Johnson et al.'s, (2020) concept of radical uncertainty – "where outcomes cannot be enumerated and probabilities cannot be assigned" (Johnson et al., 2020, p.3). They believed that risk is applied more appropriately to controlled environments such as a casino, however, could not be used to explain the highly uncertain conditions of the market. This is reflected in the learning strategies mentioned by the professionals. Although they were almost always using financial terminologies and examples when talking about uncertainty in general, the learning strategies consisted of the more social-cognitive skills such as the importance of communication, planning, curiosity, and networking. The learning strategies mentioned by the professionals have similarities to Zimmerman's SRL strategies. As the findings of this study indicate



the importance of learning in uncertainty, it called for further research to unpack these learning strategies. The relationship between the perception of uncertainty and decision-making or innovation has gained much focus (Freel, 2005; Lueg & Borisov, 2014; Meijer et al., 2006). However, little is known about how the perception of uncertainty shapes the learning processes. To that end, Study 2 examines the SRL strategies employed by finance professionals when dealing with uncertainty.

#### **4.5 Study limitations**

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This chapter reports on the findings of Study 1 that aimed to explore the perceptions of finance professional about the antecedents, consequences, and nature of uncertainties. Semi-structured interviews were selected as a method for collecting data to answer these research questions. As with any qualitative research, the inability to generalise the findings of this study was one of the main limitations. According to Creswell (2007), “to best generalise, however, the inquirer needs to select representative cases for inclusion” (p.74). Accordingly, measures were taken to purposefully select nine representatives from the selected domains of the finance industry, such that there was at least one expert and one practitioner from each.

However, the limitation associated with small sample size is acknowledged, especially since the participants were further split into two groups. As discussed in **Section 4.2.1**, the focus was not on recruiting a large number of participants, but a small number of purposefully selected professionals who would be able to provide detailed account and insider perspective on the uncertainties within the finance sector.

Another limitation was associated with the frequency counting analysis technique, as the amount of time each participant talked about a particular uncertainty situation would impact the frequency score for that category. This limitation was mitigated by carefully selecting the units of analysis. Following Weston et al.'s (2001) method of selecting units of analysis, an episode of uncertainty example was chosen as an unit of analysis, such it can could range from a single line to multiple speech bursts depending on how detailed the explanation consisted of.

The final limitation of the study comes from the researcher's inexperience in the finance sector. Most of the examples and their explanations were heavily laden with in-house finance jargons and acronyms which were difficult to interpret and analyse. For some of the recurring acronyms such as MiFID and Basel, the researcher had to get clarifications from the industry gatekeeper to fully comprehend what was being said about the uncertainty surrounding those regulatory changes. Despite these efforts, there might have been instances where it was difficult to follow the line of argument presented by the professionals.

#### **4.6 Conclusion**

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The overarching research objective of this study was, to explore the nature of uncertainties, and their antecedents and consequences as perceived by the finance professionals. To that end, semi-

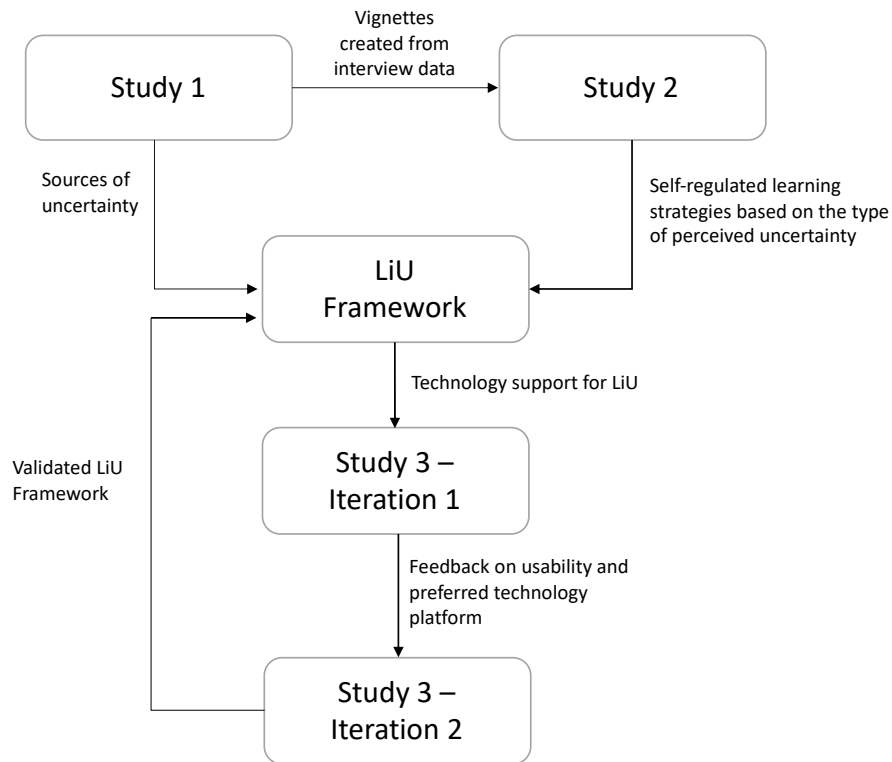
structured interviews were conducted with high-end knowledge workers from the finance sector. These interviews provided an in-depth insight into the kinds of uncertainties that finance professionals need to prepare themselves for, as well as the general perception of uncertainty within the sector. Financial crisis, structural changes, environmental influences, political strategies, and technological development emerged as the five major themes of uncertainties. The interview results also affirm the motivation and need for this research, as the financial professionals reveal experiencing uncertainty at three distinct levels – micro, meso, and macro.

Further investigations into how these uncertainties impact professionals on an individual level, and how they self-regulate their learning during these times, will be investigated in Study 2. The timeliness of this study was in sync with the dynamic political landscape at the time when interviews were conducted (e.g. Brexit) and rapid technological advances in the Fintech sector, which calls for continually adapting to changing work practices to be relevant to changing times. Emerging themes of learning strategies in uncertainty present an important avenue for the academic community to further research on workplace learning in changing times.

There were two key themes identified in this chapter. First one was that uncertainty is varied in the finance sector (sources of uncertainty and scale of uncertainty) and the way the professionals perceive it also varies (type of perceived uncertainty). The second key finding was that across all the themes identified in Study 1, importance of learning in uncertainty was recognised as one of the most important themes by all the professionals. The relationship between these two key themes of how professionals perceive uncertainty and depending on the type of uncertainty they perceive what learning strategies they employ has not been addressed in the literature. This is the gap that will be addressed in Study 2 (**Chapter 5**).

## 4.7 Linkages to other studies in this thesis

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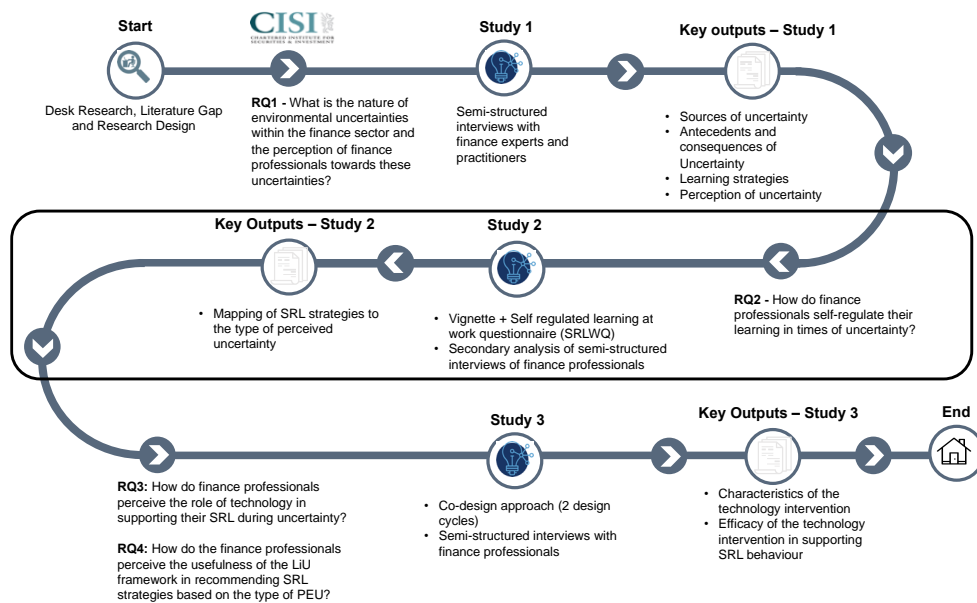


**Figure 4.18: Linkages to Study 2 and Study 3**

Study 1 examined the nature of uncertainty, sources of uncertainty within the finance sector, and the perceptions of professionals towards these uncertainties in terms of their antecedents, consequences, and strategies employed to manage the uncertainty perception. Interview data contained rich descriptions about the specific uncertainty situations typically encountered by professionals. These descriptions will be condensed into short vignettes and used in Study 2 to trigger uncertainty perception while answering the questionnaire items. A ‘Learning in Uncertainty’ (LiU framework) conceptual framework elaborating the SRL strategies employed by professionals based on the type of perceived uncertainty will be created based on the findings from RQ1 and RQ2.

## Chapter 5: Study 2 – Self regulated learning in uncertainty

Study 1 highlighted the importance of learning in uncertainty and signalled the need to unpack the learning strategies employed in uncertainty. Accordingly, Study 2 was designed to explore the relationship SRL and PEU. **Figure 5.1** captures the part of the research design that will be covered in this chapter.



**Figure 5.1: Scope of Chapter 5**

The chapter begins with **Section 5.1** outlining the research questions addressed in this chapter. **Section 5.2** describes the methods used in this study, including information about the settings, participants, questionnaire instrument design, procedure, and analytical methods. The next two sections outline the findings from the survey (**Section 5.3**) and secondary analysis (**Section 5.4**). Triangulation of results from the quantitative and qualitative analysis is presented in **Section 5.5**. The triangulated results are presented in the form of the LiU framework in **Section 5.6**. Subsequently, **Section 5.7** discusses the findings in light of existing literature and highlights the broader implication of this study in achieving the overarching research objective of understanding how finance professionals learn in uncertainty. Finally, **Section 5.8** concludes the chapter with a summary. **Section 5.9** explains the linkages with other studies in the thesis.

### 5.1 Introduction

Previous research undertaken with finance professionals found that the ability to self-regulate one's learning mediated the relationship between workplace affordances and workplace learning undertaken (Fontana et al., 2015; Milligan et al., 2015). Their findings provided a useful starting point

to investigate the learning processes in uncertainty. As discussed in Chapter 2 (**Section 2.2**), not much is known about the learning processes of finance professionals during uncertainty. Previous research has already established the SRL strategies typically employed by finance professionals. The aim of Study 2 was to build upon those findings to study the self-regulatory learning processes in the light of PEU, and if it is impacted by the type of uncertainty they perceive. To that end, the following research question was answered in Study 2:

**RQ2:** How do finance professionals self-regulate their learning in times of uncertainty?

**RQ2.1** – Does finance professionals’ choice of SRL strategies relate to the type of uncertainty they perceive?

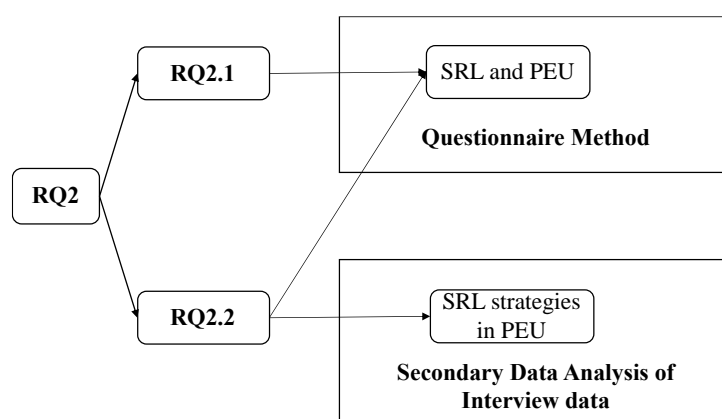
**RQ2.2** – What are the SRL strategies employed by finance professionals when they perceive uncertainty?

The next section describes in detail the methods and procedures used to address these research questions.

## 5.2 Methods

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The rationale for the adopted methodology and an overview of the research methods were outlined in **Chapter 3 (Section 3.2.2 and Sections 3.4.1 – 3.4.5)**. As discussed in **Chapter 3**, the research questions answered in Study 2 required a methodological approach that allowed for both measurements of SRL behaviours adopted by finance professionals when perceiving a workplace uncertainty and qualitative exploration of the specific strategies that they employed when working in uncertain conditions. Thus, a mixed-methods approach was deemed most appropriate to explore the SRL behaviour of finance professional in times of uncertainty (**Section 3.2.3**).



**Figure 5.2: Mixed methods design for RQ2**

**Figure 5.2** shows a visual representation of the mixed methods approach undertaken to answer RQ2. The quantitative part of the study used a questionnaire method to examine whether the learning strategies employed depended on the type of uncertainty perceived by professionals. The qualitative part of the study employed secondary analysis of interview data and served three purposes: 1) to allow qualitative interpretation of the quantitative analysis; 2) to identify specific learning strategies used by professionals in uncertainty; 3) to assess if the strategies identified in questionnaire aligned with SDA.

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## 5.2.1 Quantitative Method - Questionnaire

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### 5.2.1.1 Settings and Participant recruitment procedure

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The research questions outlined in **Section 5.1** required insights into the SRL behaviour of finance professionals when perceiving uncertainty in their workplace. As elaborated in Chapter 1 (**Section 1.1**), the Chartered Institute for Securities and Investments (CISI) was chosen as the research context. The Learning in Uncertainty (LiU) questionnaire was circulated amongst the members of CISI.

Initially, the LiU survey was emailed to 25 CISI members as a pilot. However, only two respondents completed the questionnaire. Together with the CISI gatekeeper, some cosmetic changes were made to the working in enhance clarity for improving the number of responses. For example, it was suggested that the title of the survey be changed from 'Learning in Uncertainty Survey' to 'Future proof your career in days of growing uncertainty and opportunity'. The questionnaire items remained the same. Apart from the title, there were a few other minor suggestions implemented regarding the wordings used in the questionnaire items. For example – it was suggested that the title of the uncertainty vignette 3 be changed from 'Sterling Devaluation' to 'Currency Movements' because although all the participants worked in London, they did not always deal in Sterling currency. Hence in order to make it more relatable, the title was changed to 'Currency Movements'.

After incorporating the changes from the pilot survey, questionnaire links were emailed to 100 CISI members who worked in the City of London. Of these, about 35 members started the survey, but only 23 completed it. In order to increase the number of responses three strategies were employed: 1) A reminder email was sent after 2 weeks; 2) The researcher was invited to write an article<sup>7</sup>, for the industry journal 'Review of Financial Markets', with a link to the survey; and 3) A lunchtime workshop was conducted by the researcher and their supervisor at CISI's London office entitled 'Managing Uncertainty in Finance' where the survey link was advertised at the end of the session. The workshop proved to be a success, as it was completely booked within 2 days of announcing it. It was a full house workshop, attended by 35 members from CISI.

These three steps resulted in 39 (out of 135) completed responses with a response rate of 28%. This is slightly less than the number reported by Anseel et al. (2010), where they found a mean

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<sup>7</sup> Informal Learning During Periods of Uncertainty – Available at <http://www.cisi.org/bookmark/web9/common/library/files/sironline/RFMQ217.pdf>, p.12

response rate of 34% for organisational surveys. The main purpose of this survey was to explore whether finance professionals employed specific SRL strategies based on the type of uncertainty they perceived. Hence these responses were considered sufficient for this exploratory purpose, especially since they were to be used in conjunction with findings from the secondary data analysis of interviews (**Section 5.4**).

#### **5.2.1.2 LiU survey instrument**

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As discussed in **Section 3.4.2**, survey instruments are used for collecting self-reported information from a large sample of respondents about their thoughts, feelings, perceptions, behaviours, and attitudes (Creswell & Clark, 2017). The purpose of the LiU survey instrument used in Study 2 was to classify the type of uncertainty perceived by professionals for each of the vignettes in conjunction with the SRL strategies employed during the uncertainty captured in the vignette. Incorporating quantitative Likert scale items helped in understanding macro-level trends related to SRL during uncertainty. The following sub-sections explain the uncertainty vignettes and questionnaire items included in the LiU survey.

#### **Uncertainty Vignettes**

A methodological challenge encountered during the design stage of the questionnaire was ensuring standardisation across the participants in terms of the uncertainty they were visualising while answering the survey questions. A vignette technique (Mulder, 2015) was adopted as a solution to this problem, as it provided a tangible trigger to induce a perception of uncertainty in the professionals. (See **Chapter 3, Section 3.4.3** for a detailed description of the vignette technique). Vignettes have been successfully used in previous organisational research to study complex cognitive, emotional, and behavioural attitudes (Poulou, 2001; Rungtusanatham et al., 2011). For example, Barrera and Buskens (2007) designed a vignette experiment to unpack the distinction between imitation and learning for various levels of uncertainty. Hence this technique was deemed appropriate for use in the study of learning in uncertainty.

Findings from Study 1 revealed five broad sources of uncertainty in the finance sector – Financial crisis, structural changes, environmental influences, political strategies, and technology development. Based on these categories, four uncertainty vignettes were created representing discreet approximations of authentic work situations to elicit insightful information about the professionals' cognitive processes, perception of uncertainty, and learning strategies. They were constructed by Jacob and Mulder (2019) in the same research context as the present research (CISI). Participants chose one vignette and indicated their choice within the survey. For the rest of the survey, they were asked to imagine being in the situation described in the uncertainty vignette they chose (**Table 5.1**) and answer the questions based on how they perceived that uncertainty, and what they would do if they were in that position. Data were compared between the three types of perceived environmental uncertainties – state uncertainty, effect uncertainty, and response uncertainty. The vignettes were used

only as a tangible trigger to induce uncertainty perception before answering the survey questions. Each vignette could be perceived as relating to different kinds of uncertainty, and one was not inherently more aligned to a particular type of uncertainty than another. The perceived type of uncertainty was measured in the survey, and the specific vignette chosen was not included as a variable in the analysis.

**Table 5.1: Uncertainty vignettes used in the questionnaire to trigger the perception of uncertainty**

<b>Vignette 1 – Currency Movements</b>
Imagine, you face the following work situation:
Despite recent broad-based recovery in global growth, it is not clear what impact Brexit will have on the level of investment in the UK. Brexit triggered a sharp depreciation in the Pound Sterling, and parallels have been drawn with the fall of Sterling in 1992 (devaluation) and 2008. In 1992, the Pound’s devaluation led to growth in the UK economy. Conversely, in 2008, in the wake of the financial crisis, problems with Sterling led to bleaker future prospects for the UK, since the nation’s most important export industry – the finance sector – was in serious difficulties. Therefore, it is unclear what the consequences of any further change in Sterling’s value will be. With your team, you are given an assignment to analyse the consequences of further currency movements and report your conclusions to the Board. Irrespective of the findings of your report, it is clear that these findings will have consequences for your organisation.
<b>Vignette 2 – Loss of Passporting after Brexit</b>
Imagine you face the following work situation:
It is not clear what sort of Brexit deal the British Government will be able to negotiate. With a ‘hard’ Brexit as a likely outcome, all current passporting rights that enable cross-border services (e.g. raising bonds, getting syndicated loans, and hedging loans in respect of several risk factors) might become invalid within the Euro-zone. Your team is assigned the task of developing and implementing a contingency plan for your organisation by the end of May 2018. It remains unclear if the contingency plan will include specific processes, such as downsizing, restructuring, or other relevant strategies and what the consequences of the contingency plan will be on your organisation. Irrespective of the content of the contingency plan, it is clear that it will have consequences for your organisation.
<b>Vignette 3 – FinTech and competition in the finance sector</b>
Imagine you face the following work situation
The speed of technological development makes it is unclear what the next major IT breakthrough might be. Google, Facebook, Apple and other global internet



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platforms are already investing in the FinTech sector (e.g. robo-advisory platforms, crowdfunding or credit and factoring). It is not clear how technological development will impact current ways of working. You and three other colleagues are given an assignment to analyse FinTech trends and to report the findings to the board. Irrespective of the findings of your report, it is clear that these findings will have consequences on your organisation.

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#### **Vignette 4 – Significant increase in demand for socially and ecologically responsible investments**

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Imagine you face the following work situation

The need and demand for socially and ecologically responsible investments has surged in recent years. The chief aim is to allow investors to do more with their money than simply achieve financial returns, by driving positive social and environmental impacts in tandem with mainstream objectives. The board of your organisation has decided to develop such investments into a mainstream business activity and to put you in charge of the market initiative. This responsibility includes assembling a team to carry out an analysis of the current market and to identify the strong (and weaker) players under your instructions. Furthermore, you have to evaluate how your organisation can assert and develop itself in an already overcrowded market segment in a minimum of time and thus create a competitive advantage.

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The following sub-sections provides a detailed description of the questionnaire items included in the LiU survey.

### **Quantitative questionnaire items**

In order to measure the SRL behaviour and perception towards environmental uncertainty, several validated scales were used. These scales are described in the following sections.

#### **1) Self-Regulated Learning**

RQ2 aimed to understand how finance professionals self-regulate their learning in uncertainty. As highlighted in the literature review (see **Section 2.2**), there are very few empirical studies investigating whether professionals' learning strategies are dependent on the type of uncertainty they perceive. Therefore, it was important to first establish the relationship between SRL and type of uncertainty (Study 2), before designing an intervention to support the SRL of professionals during uncertainty (Study 3). This study operationalised SRL using Zimmermann's model (see **Section 2.7**) that views SRL strategies as "actions and processes directed at acquiring information or skill that involve agency, purpose, and instrumentality perceptions" (1989, p.329).

In order to measure these strategies, the Self-regulated Learning at Work Questionnaire (SRLWQ) developed by Fontana et al. (2015) was used. This scale was originally developed and validated with 170 finance professionals in the same context (finance sector) and settings (CISI members) as Study 2, thus increasing its appropriateness for use in this study (Fontana et al., 2015). Items were adapted to make the questions relevant to the uncertainty situation presented in the vignette. The SRLWQ instrument is comprised of 44 item questions, each of which were adapted for learning in uncertainty context. These 44 items were organised as three sections, each reflecting Zimmerman's (2000) three phases of SRL: forethought, performance, and self-reflection. **Table 5.2** presents the definitions of SRL phases and sub-processes measured by the questionnaire items. The SRL scores were measured using a five-point Likert scale (where 1 = 'not at all true for me' and 5 = 'very true for me'). The exact phrasing of the items used in the Study 2 questionnaire is outlined in the first section of **Table 5.3**.

A composite SRL score (SRL Tot) was calculated for each respondent by aggregating the scores from the eleven sub-factors described in **Table 5.2**. This method of aggregating the scores of SRL sub-processes to obtain a total SRL score has been adopted in previous research (Littlejohn et al., 2016; Dalsgaard et al., 2019). It is important to note that these SRL scores are measures of self-perception, rather than absolute measures of SRL performance.

**Table 5.2: Description of SRL sub-process**

<b>SRL Phase</b>	<b>SRL sub-process</b>	<b>Description</b>	<b>Sample Item</b>
<b>Forethought</b>	Goal Setting	Ability to set learning goals and work towards achieving them. It also includes your ability to realign your goals when learning requirements have changed.	I set personal standards for performance in my learning.
	Strategic Planning	Ability to identify a need for learning and taking purposive actions to undertake that learning	I thought of alternative ways to solve a problem and choose the best one.
	Task Interest and Value	Ability to recognise the importance and value of your learning activity.	I think I will be able to use what I learnt in the future.
	Self-Efficacy	Belief in your inherent capabilities to achieving your set target	I could cope with learning new things because I could rely on my abilities.
<b>Performance</b>	Task Strategies	Range of learning strategies you employ based on the demands of your job.	I tried to translate new information into my own words.
	Elaboration	Ability to apply the learning in wider contexts	When I was learning, I tried to relate new information I found to what I already knew.
	Critical Thinking	Ability to objectively evaluate and analyse your learning needs.	During learning I treated the resources I found as a starting point and tried to develop my own ideas from them.

<b>Self-Reflection</b>	Seeking Help	Ability to call upon your social networks, colleagues, experts in your area to enhance your knowledge.	When I did not understand something, I asked other for help.
	Self-Satisfaction	Sense of contentment with your learning accomplishments, that fuels your motivation to further your learning goals.	I often think about how my learning fits in to the 'bigger picture' of my work/practice
	Self-Evaluation	Ability to identify your own strengths and weaknesses in order to develop your skills and abilities to enhance your strengths and address your weaknesses.	I know how well I have learned once I have finished a task.

## 2) Perceived environmental uncertainty (PEU)

The underlying focus of this thesis was to understand finance professionals' learning behaviour during uncertainty. Hence, in order to operationalise the construct of uncertainty, it was necessary to include items measuring the professionals' perception of uncertainty. Research shows that differentiating the perceived uncertainty into state, effect, and response uncertainty represents reality more closely than treating it as a holistic construct (Ashill & Jobber, 2010; Milliken 1987; Duncan 1972). Thus Milliken's (1990) PEU framework was used in this study to measure the perception of finance professionals when dealing with situations depicted in the uncertainty vignette. Items for measuring PEU were adapted from Ashill and Jobber's (2010) validated instrument. They developed and validated the PEU scale based on a two-phase empirical study (exploratory qualitative phase – 20 interviews and instrument validation – 204 professionals from manufacturing, services, consumer, and industrial product business). As with the SRL scale, items from the original scale were slightly modified to reflect the perception of uncertainty pertaining to the vignette (**Table 5.3**). Altogether, the PEU scale measured the type of uncertainty perceived by the professionals pertaining to the situation depicted in the vignette.

## 3) Background information

Professionals' background information such as job title, years of experience, and subdomain within finance sector were collected as part of the questionnaire. The data collected from these variables helped in contextualising the responses as per their nature of work and level of expertise.

## Questionnaire validity and reliability

As a first step, Cronbach's (1951) alpha reliability analysis was employed for initial scale purification. Initial alpha value was 0.63. On the basis of the "alpha increase if item deleted" criterion (Tabachnick and Fidell, 2001)) four items from the SRL scale were removed leaving the scale with 42 items and a very high alpha value of 0.82 indicating excellent overall internal consistency (Tabachnick and Fidell, 2001) (**Table 5.3**). Before performing the statistical analysis, sample ( $n = 39$ ) was examined for adequacy. According to Yurdugul (2008) minimum sample size required for coefficient alpha depends on the first eigenvalue obtained from Principal Component Analysis (PCA). Based on Monte-Carlo simulations with bootstrap technique, Yurdugul (2008) found that if the first eigenvalue is higher than 6.00 then the coefficient alpha is a robust estimator of the population coefficient, even with sample size as low as 30. In this study, the first PCA eigenvalue was 15.313 and communalities were at an average of 0.78. This indicated that the sample size was sufficient for reliability analysis of the questionnaire and further statistical analysis (**Section 5.3.1**).

**Table 5.3: Study 2 questionnaire scales, items, and Cronbach alpha**

Scale	Sub-processes	N Items	Question ID	Question	Cronbach's Alpha
Self-Regulated Learning	Forethought	14	SRLF1	I set long-term goals (monthly or yearly) in order to direct my learning activities	0.8
			SRLF2	I set realistic deadlines for learning when I have identified a learning need.	
			SRLF3	I set goals to help me manage the time I spend learning.	
			SRLF4	I ask myself questions about each learning task before I begin.	
			SRLF5	I use specific strategies for different types of things I need to learn.	
			SRLF6	I can use what I learn in this job in the future.	
			SRLF7	I prioritize learning new things on the job	
			SRLF8	I can remain calm because I can rely on my abilities.	
			SRLF9	I can usually find several solutions, when confronted with this situation in my job.	
			SRLF10	I can usually handle whatever comes my way.	
			SRLF11	I feel prepared for my occupational future because of the past experiences in my workplace	
			SRLF12	I meet the goals that I set for myself.	
			SRLF13	I feel prepared for most of the demands.	
			SRLF14	I think that learning that I undertake in this situation is important to me.	
	Performance	15	SRLP1	I write down a plan to describe how I hope to achieve my learning goals.	0.79

			SRLP2	I ask myself how what I'm learning is related to what I already know.	
			SRLP3	I change strategies when I don't make progress while learning.	
			SRLP4	I make notes (including diagrams, etc.) to help organise my thoughts.	
			SRLP5	I focus on the meaning and significance of new information.	
			SRLP6	I try to relate new knowledge I find to what I already know.	
			SRLP7	I bring together information from different sources (for example people and resources).	
			SRLP8	I treat the resources I find as a starting point and try to develop my own ideas from them.	
			SRLP9	I ask my colleagues for help, when I am unable to understand something.	
			SRLP10	I identify colleagues in my workplace whom I can ask for help if I need it.	
			SRLP11	I fill in the gaps in my knowledge by getting hold of the appropriate material.	
			SRLP12	I try to understand the problem as thoroughly as possible	
			SRLP13	I prefer tasks that arouse my curiosity, even if I need to learn to achieve them	
			SRLP15	I apply ideas from my previous experience.	
	Self-Reflection	6	SRLSR1	I know how well I have learned once I have finished a task.	0.83
			SRLSR2	I ask myself if there were other ways to do things after I finish a task.	
			SRLSR3	I think about what I've learned after I finish.	

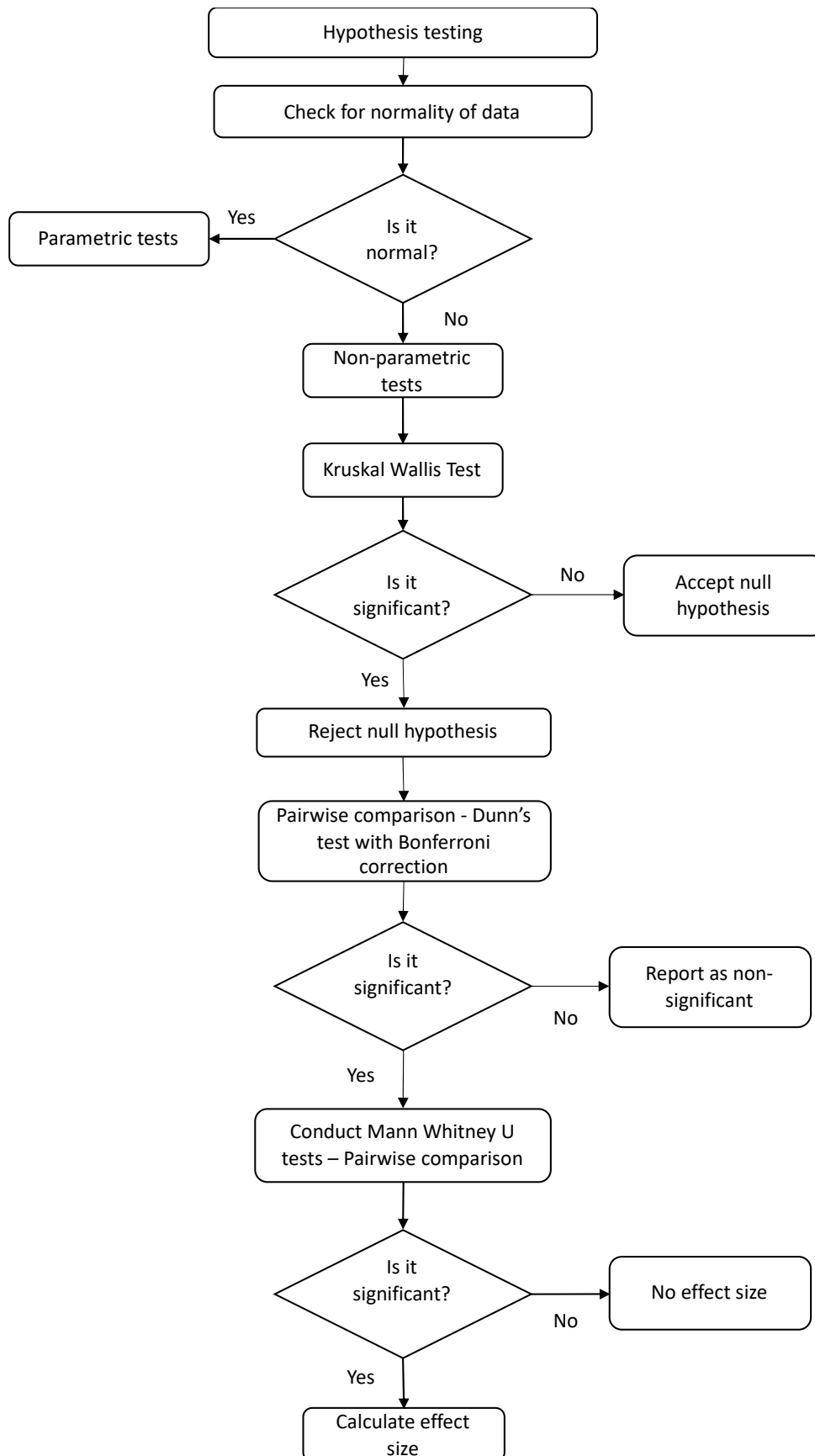
			SRLSR4	I think about how what I've learned fits in to the 'bigger picture' at my organisation.	
			SRLSR5	I try to understand how new information I've learned impacts my work.	
			SRLSR6	I consider how what I've learned relates to my team.	
Type of Uncertainty	State Uncertainty	6	TU1	what my workplace's environment will be like in 1 year from now	0.85
			TU2	how probable the occurrence of that uncertainty is	
	Effect Uncertainty		TU3	what impact this uncertainty will have on my workplace	
			TU4	if my organisation's reaction on that uncertainty will have a positive effect on my workplace	
	Response Uncertainty		TU5	what different response options I have to manage this uncertainty	
			TU6	if my response to this uncertainty will produce desirable outcomes	



### 5.2.1.3 Quantitative Data Analysis

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The quantitative analysis in Study 2 aimed to answer RQ 2.1 by comparing the SRL phases and sub-processes across the three types of uncertainties perceived by the professionals. A composite variable was created for measuring the total SRL score (SRL\_Tot) by aggregating all the values of SRL sub-processes. This method of measuring SRL behaviour based on aggregate scores was used by Milligan et al. (2015). Average scores of the individual SRL sub-processes were used to unpack further the differences in SRL strategies based on the type of PEU. Since the aim was to find if there are statistically significant differences between two or more groups of an independent variable (type of PEU) on an ordinal variable (SRL\_Tot, SRL phases and sub-processes), hypothesis test was the most appropriate method to answer the research question. **Figure 5.3** depicts the steps undertaken to determine the type of hypothesis test to be conducted.



**Figure 5.3: Flowchart depicting the steps for quantitative analysis**

The Shapiro-Wilk test was used to assess the normality of data. The p-value for Shapiro-Wilk test for most of the variables used for hypothesis test is less than 0.05, suggesting that the data is not normally distributed (**Table 5.4**).

**Table 5.4: Test of Normality – Shapiro Wilk method**

	Shapiro-Wilk		
	Statistic	df	Sig.
SRL Total	0.97	39	0.368

Non-normal distribution of data warranted the use of non-parametric statistical tests. The Kruskal Wallis hypothesis test is a rank-based non-parametric test that is used to determine if the differences between two or more groups of an independent variable are statistically significant (Field, 2013). The assumptions of independent observations (type of PEU), and the ordinal outcome variable (SRL total score) was met. Hence, the Kruskal-Wallis test was conducted to examine the differences in SRL strategies as per the types of perceived uncertainty.

Although the Kruskal-Wallis test is widely used to analyse non-parametric data (Fan & Zhang, 2012), its effect sizes are rarely reported. This may be due to the lack of a straightforward way to compute effect sizes in a non-parametric test. The limitation with reporting only p-value is that it is dependent on the sample size, and sometimes a significant result simply indicates a large sample size (Sullivan & Feinn, 2012). To address this limitation, Tomczak and Tomczak (2014) have proposed the mathematical formula to compute an epsilon-squared estimate of effect size, specifically for Kruskal Wallis test:

$$\epsilon^2 = \frac{H}{(n^2 - 1) / ((n + 1))}$$

H – the Kruskal Wallis H-test statistic

N – the total number of observations

$\epsilon^2$  – value ranges from 0 (no relationship) to 1 (perfect relationship)

Effect sizes for all the statistical tests conducted in this study were calculated using this equation and interpreted using Rea and Parker's (2014) Kruskal Wallis effect size estimates (see **Table 5.5**)

**Table 5.5: Effect Size measurements for all the Kruskal Wallis test variables**

Rea and Parker (1992) – Kruskal Wallis Effect Size estimates
0.00 < 0.01 - Negligible
0.01 < 0.04 - Weak
0.04 < 0.16 - Moderate
0.16 < 0.36 - Relatively strong
0.36 < 0.64 - Strong
0.64 < 1.00 - Very strong

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### 5.2.2 Qualitative Method – Secondary data analysis

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Secondary data analysis (SDA) of qualitative datasets collected from previous research has been gaining momentum (Heaton, 2004; Irwin, 2013). It is used in innovative ways to answer new research questions from existing qualitative data (Bishop, 2007; Fielding, 2000; Notz, 2007) (See **Section 3.4.4** for a detailed description and methodological implications of SDA). It is especially useful in accessing an elusive population (Long-Sutehall et al., 2011). Experiences of recruiting research participants for interviews in Study 1 and the survey in Study 2 revealed the challenges in participant recruitment in the finance sector. Previous research has also reported similar challenges (Fontana et al., 2015) while enlisting participants from the finance sector. Hence, adopting the SDA approach was deemed appropriate, as it fulfilled two aims – 1) Accessing a research population that was challenging to reach, and 2) Triangulating the findings from the quantitative study.

#### 5.2.2.1 Research context of primary study

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The primary data consisted of interview transcripts from thirty semi-structured interviews (21 male and 9 female) conducted by Littlejohn et al., (2016) with members of CISI across eighteen financial organisations in the UK. The participants were representative of various seniority levels within CISI (14 senior managers, 9 frontline managers, 7 frontline staff). Their average age was 50.87 years (SD=6.97), and they had an average experience of 19.2 years (SD=14.28).

The aim of the primary study was to examine how professionals self-regulate their learning through work activities. In a dynamic sector such as finance, most of the workplace learning that happens is spontaneous and reactive (Eraut, 2011). Since their learning is not purposeful, the professionals fail to acknowledge that it has happened. They mostly equate the term ‘learning’ with formal training. This is a known issue in workplace learning, that one must never directly ask professionals about learning (Simons & Ruijters, 2004). Thus, researchers of the primary study had to adopt a creative approach for eliciting data about their SRL strategies at work. Before the interviews,

participants were asked to think of a recent work task where they had to change their work practice. The SRL related questions in the subsequent interviews were asked in relation to this work task. This contextualisation enabled the researchers to facilitate the identification and acknowledgement of learning that happened during the change in work practices. In the context of this thesis, the work-task approach taken in the secondary data was complementary to the vignette approach adopted Study 2– a quantitative survey. This enhanced comparability of secondary data from the interview transcripts with primary data from Study 2.

**Table 5.6: Participant details from the interview data (Littlejohn et al., 2016, p.213)**

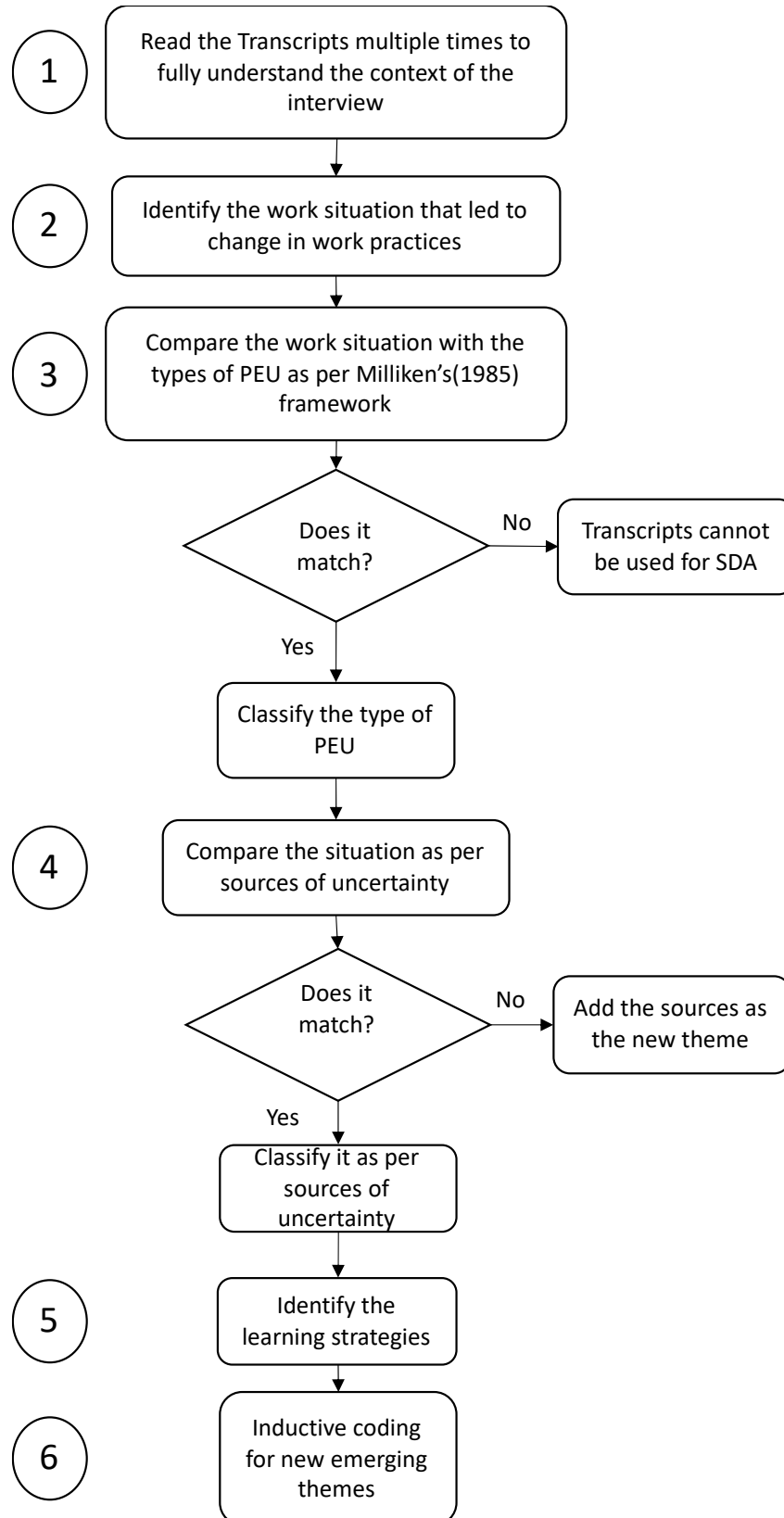
<b>Participant ID</b>	<b>SRL Rank</b>	<b>Gender</b>	<b>Role</b>	<b>SRL Total Score</b>
1	1	M	Director	201
2	2	M	Manager, Internal Audit	189
3	4	M	Financial Consultant	183
4	4	M	Risk Manager	183
5	4	F	Manager	183
6	6	F	Manager, Operational Change	178
7	7	F	Senior Competition Manager	177
8	8	M	Manager, Compliance	173
9	9	M	Manager, Call Centre	172
10	10	M	Credit Risk Manager	171
11	11	F	HR Professional	169
12	12.5	F	Manager, complaints	167
13	12.5	M	Manager, Call Centre	167
14	14	F	Risk Manager	166
15	15	M	Manager, Compliance	165
16	16	M	Risk Manager	161
17	17	M	Director	160
18	18	M	Analyst	159
19	19	M	Compliance Officer	149
20	20.5	M	HR Professional	147
21	20.5	M	Finance Manager	147
22	21	M	Manager, customer relations	146

23	22	M	CEO, Small Business	141
24	23	M	Associate Director	137
25	24	M	Risk Analyst	131
26	25	M	Manager, Finance	129
27	26	F	Manager	128
28	27	F	Risk Manager	122
29	28	F	Business Support Manager	121
30	29	M	Business Support Manager	105

### 5.2.2.2 Analytical Methods

#### Preparing the data for secondary analysis

The data from Littlejohn et al.'s (2016) study presented an opportunity to analyse the self-regulation strategies of professionals during different types of real-life work situations (interview schedule used for data collection is provided in Appendix 10). The data was in the form of interview transcripts. In order for the data to be relevant, the first task was to determine if the learning strategies discussed during the interviews were adopted in times of perceived uncertainty. During the data collection process, the professionals were asked to give an in-depth account of a recent change in their work environment that led to changes in their work practices due to which they had to undertake some learning activities. The rich accounts of learning situations provided by the professionals made it possible to assess if their situation could be interpreted as an uncertain situation. One of the often-cited limitations for using qualitative data in the secondary analysis is that since the researcher has not been involved in collection or transcription of data, they cannot be completely immersed in the data, thus limiting the qualitative insights that can be drawn it (Irwin, 2013; Medjedović & Witzel, 2008). Ruggiano and Perry (2019) urge researchers to understand the context of the primary study and to read and re-read the transcripts multiple times in order to immerse in the data fully. Accordingly, rigorous measures were undertaken in order to prepare the data for secondary analysis. **Figure 5.4** depicts the stepwise process implemented for each of the 30 interview transcripts:



**Figure 5.4: Flowchart depicting the steps for preparation of data for SDA**

**Table 5.7** provides an example of steps taken to prepare an interview transcript for secondary data analysis as per the process flow chart depicted in **Figure 5.4**.

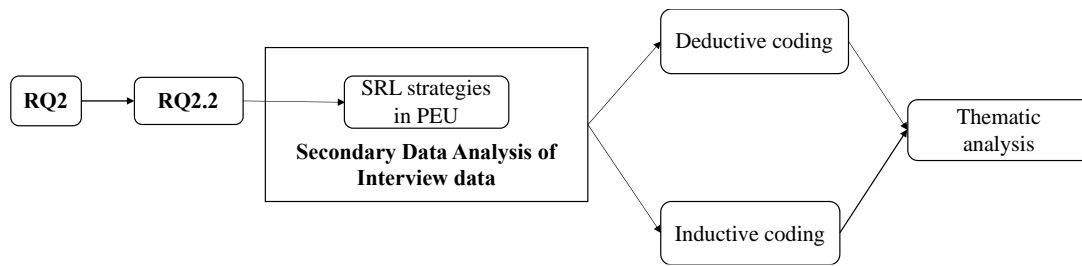
**Table 5.7: Example of preparation of Participant 1's transcript**

Step	Activity	Output
Step 1	Read the interview transcript of <b>Participant 1</b> multiple times	Researcher understood the context of the interview responses.
Step 2	Identify the work situation	'I'm trying to understand the nature of the rolling economic crisis we are experiencing and what implications that has for civilisation, not just for my job'
Step 3	Compare the work situation with Milliken's PEU definitions	State Uncertainty (inability to understand the components of external environment) Effect Uncertainty (inability to predict the consequence of the change on them/their organisation)
Step 4	Compare the work situation with sources of uncertainty identified in Study 1	Financial crises
Step 5	Identify learning strategies	1) Discussion with CISI members 2) Mind-mapping 3) Vensim (system syncing approach to critical thinking)
Step 6	Inductive coding for new emerging themes	Reading and searching for the gaps in literature to enhance their knowledge on the topic

This process was carried out for all the 30 interview transcripts. This sub-section explained how primary data was prepared for secondary analysis. **Section 5.2.2.2** notes the analytical methods used to analyse the secondary data.



## Thematic Analysis



**Figure 5.5: Thematic Analysis for answering RQ2**

The same coding (deductive and inductive coding) and TA (Clarke and Braun, 2019) approach was used as in Study 1 (Section 4.2.3.1 and Section 4.2.3.2). After preparing the data as explained in Section 5.3.2.1, TA was conducted on transcripts chosen for analysis.

## 5.3 Results – RQ 2.1

### 5.3.1 Descriptive Statistics

The data set consisted of data from 39 professionals, of which 35 were male, and 4 were female. The average job experience of the respondents was 14 years, with a minimum of 2 years and maximum of 30 years. Vignette 1 – Current Movements was chosen as an uncertainty situation by 7 respondents. 11 of them chose Vignette 2 – Loss of passporting after Brexit, 21 chose Vignette 3 – Fintech and competition. Vignette 4 – Significant increase in demands for socially and ecologically responsible investments was not chosen by anyone. Based on the responses from the type of uncertainty scale, the type of perceived uncertainty for the chosen vignette situation was calculated based on the scores of the PEU scale items included in the questionnaire. Perception of state uncertainty was reported by 9 respondents, effect uncertainty was reported by 23 respondents, and 7 reported response uncertainty.

Table 5.8 shows the descriptive statistics of the average values of the variables used in statistical analysis:

**Table 5.8: Descriptive statistics for Study 2 – Quantitative survey**

	N	Min	Max	Mean	Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Statistic
<b>SRL Total</b>	39	85	198	137.12	30.69

<b>Forethought</b>	39	2	4.86	3.07	0.74
<b>Performance</b>	39	1.95	4.96	3.05	0.90
<b>Self-Reflection</b>	39	2	5	3.50	1.06
<b>Strategic Planning (Avg)</b>	39	2	5	3.08	0.79
<b>Self-Efficacy (Avg)</b>	39	2	5	3.03	0.87
<b>Goal Setting (Avg)</b>	39	2	5	3.20	0.93
<b>Task Interest Value (Avg)</b>	39	2	5	2.98	0.89
<b>Elaboration Strategies (Avg)</b>	39	2	4.83	3.10	0.99
<b>Task Strategies (Avg)</b>	39	1.8	5	3.23	0.97
<b>Critical Thinking (Avg)</b>	39	2	5	2.94	0.99
<b>Help Seeking (Avg)</b>	39	1.5	5	2.93	1.05
<b>Self-Evaluation (Avg)</b>	39	2	5	3.58	1.04
<b>Self-Satisfaction (Avg)</b>	39	1.67	5	3.41	1.13

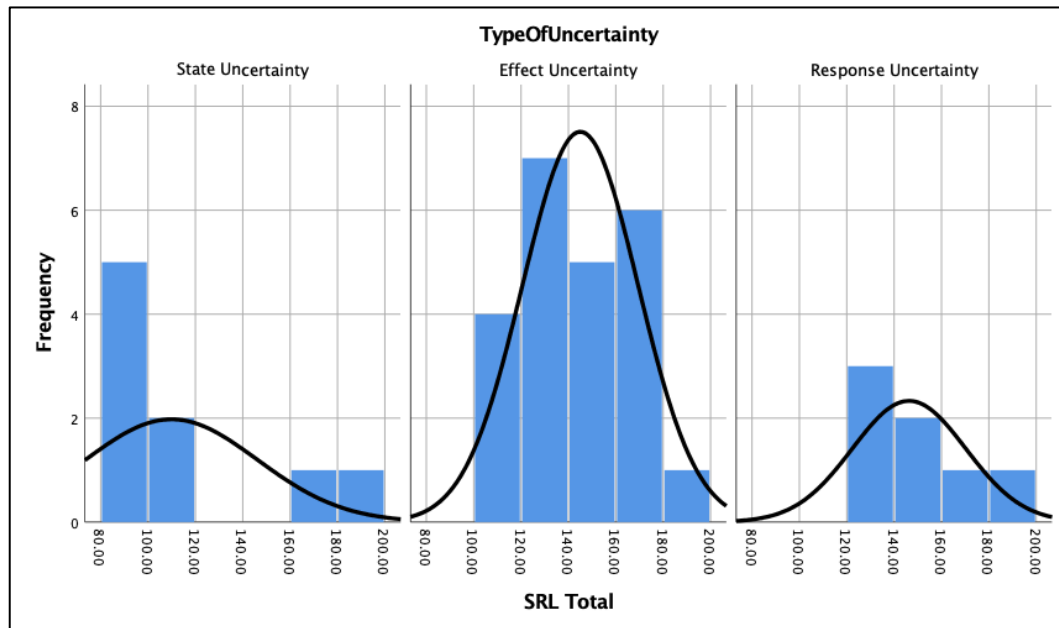
A composite value for all SRL variables was calculated called SRL\_Tot. This is in accordance with the method used by Milligan et al., (2015) and (Allison Littlejohn, Milligan, et al., 2016) in their study with finance professionals, where they used aggregate SRL scores to classify the professionals as per their ability to self-regulate their learning. Aggregate scores were also calculated for each of the three SRL phases – Forethought, Performance, and Self-Reflection. In order to test the hypotheses ( $H_{10}$ ,  $H_{20}$ ,  $H_{30}$ ) whether SRL strategies differ according to the type of perceived uncertainty, average scores were calculated for each of the SRL sub-processes within the three phases – Strategic planning, self-efficacy, goal setting, task interest/value, elaboration strategies, task strategies, critical thinking, help-seeking, self-evaluation, self-satisfaction. The next sub-section presents the results from Kruskal Wallis hypothesis tests.

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### 5.3.2 Findings – Kruskal Wallis Hypothesis Test

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RQ 2.1 examines the relationship between SRL and PEU. As discussed in **Section 5.2.1.3**, Kruskal Wallis hypothesis tests were used to answer the research question.



**Figure 5.6: Comparing Frequency Distribution of SRL Total Scores between the three types of PEU**

**Figure 5.6** shows frequency distribution of SRL scores across the three types of PEU. The SRL strategies showed significant differences across the three types of PEU ( $X^2 = 7.569$ ,  $p = 0.023$ ,  $df = 2$ ,  $\epsilon^2 = 0.199$ ). This warranted further examination of SRL phases to determine if there were differences in individual phases – forethought, performance, self-reflection based on the type of PEU (**Figure 5.7**).

Hypothesis Test Summary				
	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Forethought is the same across categories of TypeOfUncertainty.	Independent-Samples Kruskal-Wallis Test	.005	Reject the null hypothesis.
2	The distribution of Performance is the same across categories of TypeOfUncertainty.	Independent-Samples Kruskal-Wallis Test	.094	Retain the null hypothesis.
3	The distribution of Self Reflection is the same across categories of TypeOfUncertainty.	Independent-Samples Kruskal-Wallis Test	.006	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

**Figure 5.7: Hypothesis summary of Kruskal Wallis test comparing Forethought, Performance, and Self-Reflection phases of SRL across different types of PEU**

Among the SRL phases, significant differences were found in the Forethought phase ( $X^2 = 10.659$ ,  $p = 0.005$ ,  $df = 2$ ,  $\epsilon^2 = 0.281$ ) and self-reflection phase ( $X^2 = 10.214$ ,  $p = 0.006$ ,  $df = 2$ ,  $\epsilon^2 = 0.269$ ). However, no significant differences were seen in performance ( $X^2 = 4.723$ ,  $p = 0.094$ ,  $df = 2$ ) (Figure 5.7). These results warranted further investigation into the individual sub-processes constituting the SRL phases. The results of these investigations are outlined below.

### 5.3.2.1 Hypothesis 1 - The choice of learning strategies related to forethought SRL sub-process depends on the type of PEU

As per Zimmerman's (2000) SRL model, Forethought phase consists of four subprocesses: strategic planning, self-efficacy, goal setting, and task interest value. Strategic planning can be defined as the ability to identify the need for learning and taking purposive actions to undertake that learning. Self-efficacy refers to the learners' belief in their inherent capabilities to achieve their set target. Goal setting refers to the learners' ability to set learning goals and work towards achieving them it also includes the ability to realign their goals when learning requirements have changed. Task interest and value refers to one's ability to recognise the importance and value of their learning activity. Kruskal Wallis hypothesis test was carried to find out whether there were significant differences in the way learners employed these sub-processes depending on the type of uncertainty they perceived. Figure 5.8 presents summary of hypothesis tests carried out for forethought sub-processes.

Hypothesis Test Summary			
	Null Hypothesis	Test	Sig.
1	The distribution of StrategicPlanning_Avg is the same across categories of TypeOfUncertainty.	Independent-Samples Kruskal-Wallis Test	.010
2	The distribution of SelfEfficacy_Avg is the same across categories of TypeOfUncertainty.	Independent-Samples Kruskal-Wallis Test	.084
3	The distribution of GoalSetting_Avg is the same across categories of TypeOfUncertainty.	Independent-Samples Kruskal-Wallis Test	.005
4	The distribution of TaskInterestValue_Avg is the same across categories of TypeOfUncertainty.	Independent-Samples Kruskal-Wallis Test	.001

Decision

Reject the null hypothesis.

Retain the null hypothesis.

Reject the null hypothesis.

Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

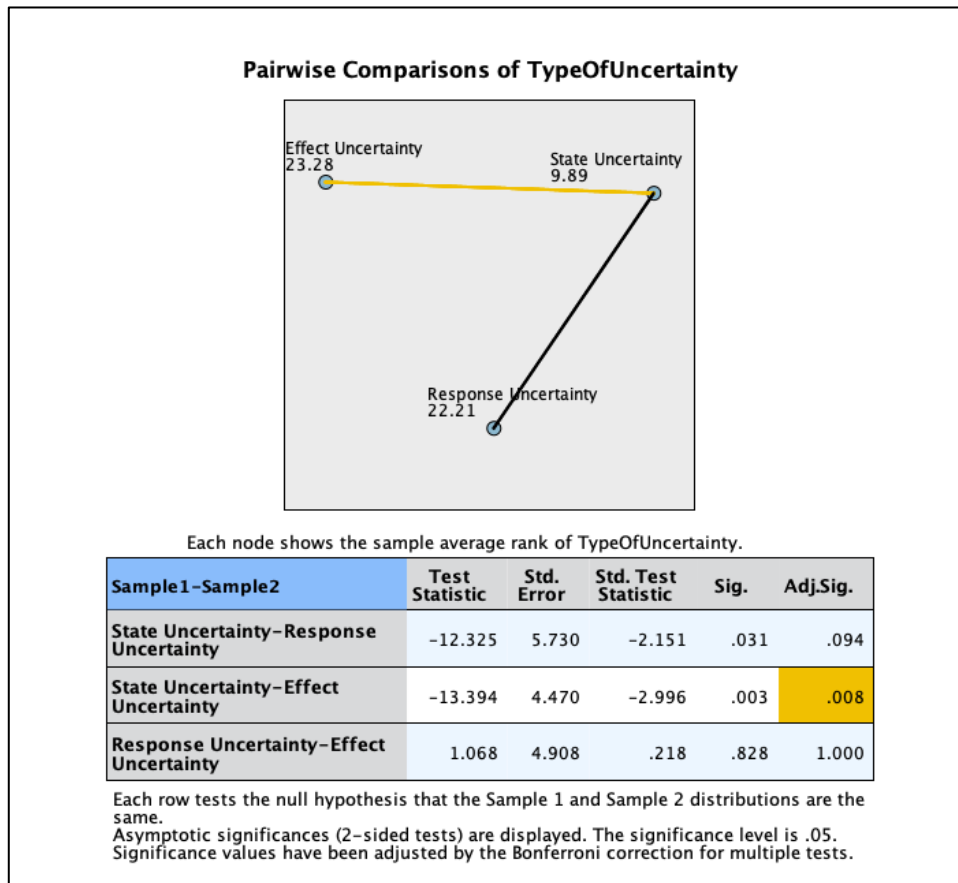
Figure 5.8: Hypothesis summary of Kruskal Wallis test comparing the Forethought sub-processes across different types of PEU

Among the Forethought subprocesses, task interest /value ( $X^2 = 14.346$ ,  $p = 0.001$ ,  $df = 2$ ,  $\epsilon^2 = 0.378$ ) differed significantly across the three types of perceived uncertainty. Relatively strong effect was seen in strategic planning ( $X^2 = 9.301$ ,  $p = 0.01$ ,  $df = 2$ ,  $\epsilon^2 = 0.245$ ) and goal setting ( $X^2 = 10.46$ ,  $p = 0.005$ ,  $df = 2$ ,  $\epsilon^2 = 0.275$ ) activities employed by the professionals. However, the type of perceived uncertainty did not have a significant effect on Self Efficacy ( $X^2 = 4.952$ ,  $p = 0.084$ ,  $df = 2$ ) of respondents. Thus, the null hypothesis –  $H_{10}$  that forethought sub-processes of SRL are equal across all three types of PEU, was rejected based on these results.

Since significant differences were observed for strategic planning, goal setting, and task interest/value, it required further examination in through pairwise comparison. **Figure 5.9, Figure 5.10, Figure 5.11** show the results from Dunn's post hoc tests carried out to examine the pairwise comparisons between each of three types of PEU for the forethought sub-processes. The model viewer in SPSS (as seen in **Figure 5.9**) uses Dunn's test with Bonferroni correction<sup>8</sup>. The null hypothesis for Dunn's test is that there are no differences in two groups which may or may not be of equal sizes. The significance values for Dunn's test are slightly higher than those found for Mann Whitney U tests. Hence both the tests were carried out in order to compare the significance values. In the first step, Dunn's test provided the relative sizes between the pairs which helped identify the pairs for individual post-hoc tests. For example, **Figure 5.9** shows results from Dunn's post-hoc test with Bonferroni correction investigating the pairwise differences in strategic planning. It shows that probability of undertaking strategic planning is significantly different between state uncertainty and effect uncertainty ( $p = 0.008$ ). No other differences were statistically significant.

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<sup>8</sup> Bonferroni Correction – As multiple tests are carried out in Dunn's post hoc analysis; an adjustment is made to the p-value to counteract the effect of multiple comparisons and to reduce the risk of Type 1 error. The Bonferroni correction is made by multiplying each Dunn's p-value by the total number of tests being carried out.



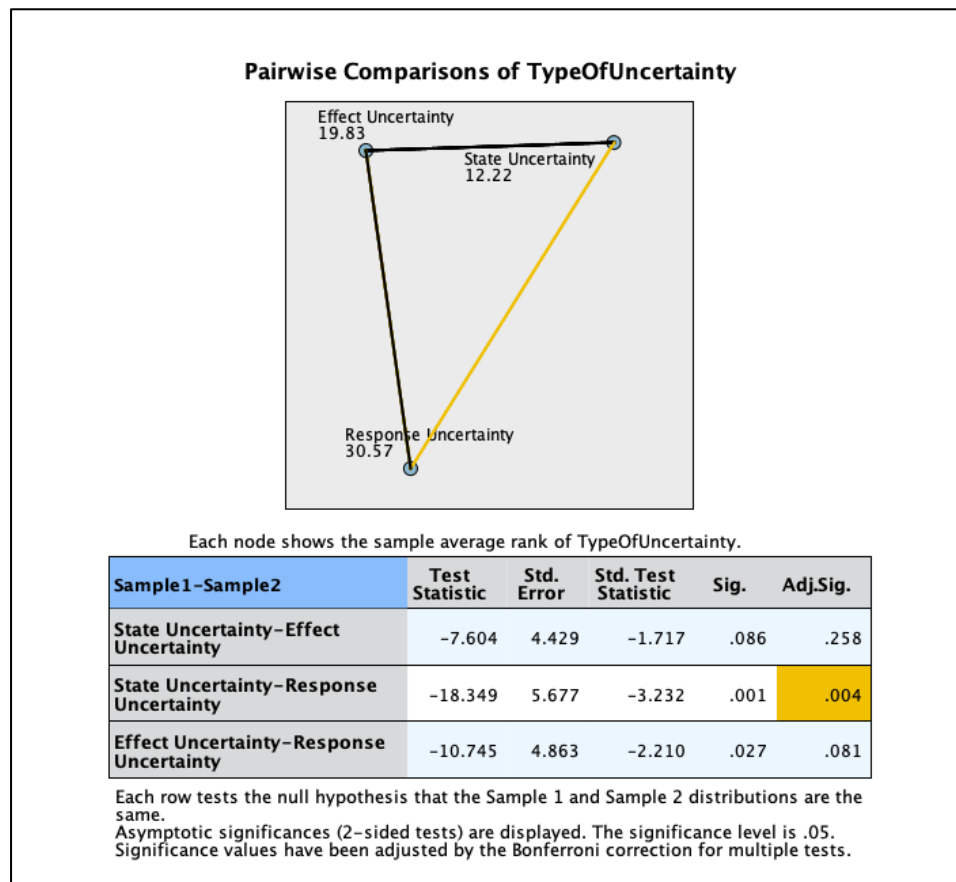
**Figure 5.9: Post-hoc test using Dunn's Test with Bonferroni Correction investigating the pairwise differences in Strategic Planning**

Then, in the second step, Mann Whitney U tests were carried out to find out which type of uncertainty has the higher mean rank, in other words, which of the two groups has within group variance. An individual Mann Whitney U post hoc test was conducted to examine the magnitude of difference between state and effect uncertainty ( $U = 32.5$ ,  $p = 0.002$ ). Comparison of mean ranks reveals that strategic planning is higher during perception of effect uncertainty as compared to state uncertainty (Table 5.9).

**Table 5.9: Mann- Whitney U Test for Strategic Planning**

	Type of Uncertainty	N	Mean Rank	Sum of Ranks
Strategic Planning	State Uncertainty	9	8.61	77.5
	Effect Uncertainty	23	19.59	450.5
	Total	32		

**Figure 5.10** shows results from Dunn’s post-hoc test investigating the pairwise differences in goal setting sub-process. It shows that propensity to set goals is significantly different between state uncertainty and response uncertainty ( $p = 0.004$ ). No other differences were statistically significant.



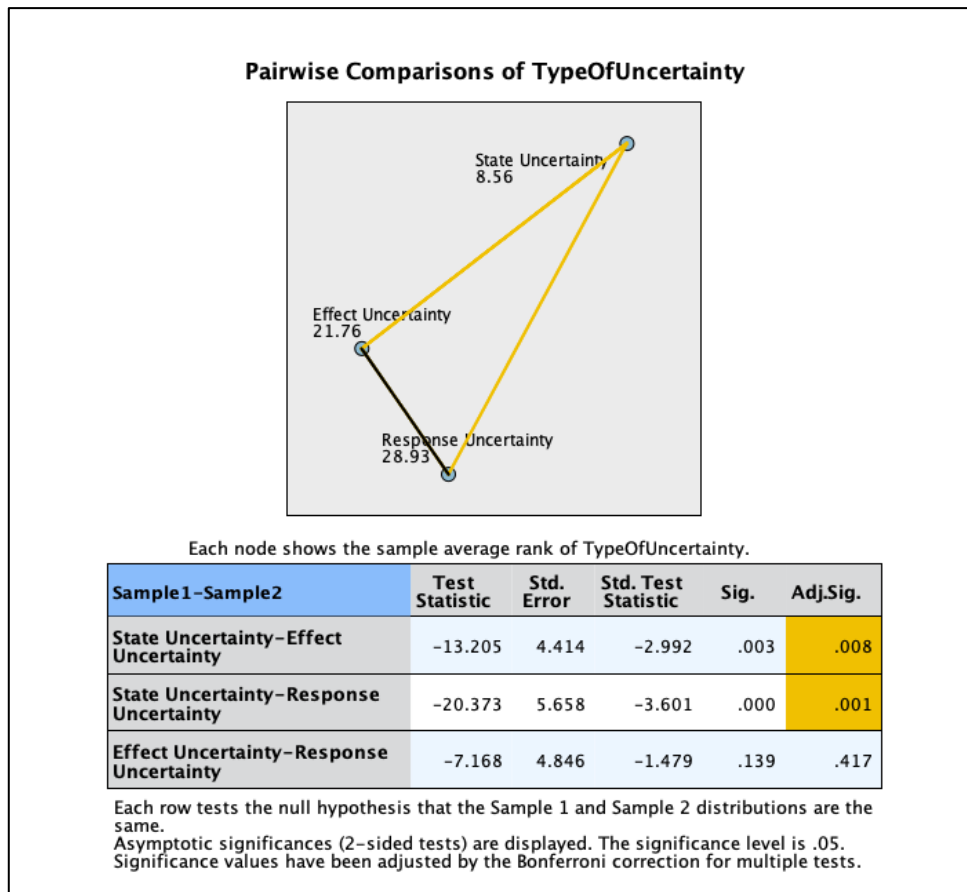
**Figure 5.10: Post-hoc test using Dunn’s Test with Bonferroni Correction investigating the pairwise differences in Goal Setting**

Mann Whitney U post hoc test was conducted to examine the magnitude of difference between state and effect uncertainty ( $U = 5.000$ ,  $p = 0.003$ ). Comparison of mean ranks reveals that goal setting is higher during perception of response uncertainty as compared to state uncertainty (Table 5.10).

**Table 5.10: Mann- Whitney U Test for Goal Setting**

	Type of Uncertainty	N	Mean Rank	Sum of Ranks
<b>Goal Setting</b>	State Uncertainty	9	5.56	50.00
	Response Uncertainty	7	12.29	86.00
	Total	16		

**Figure 5.11** shows results from Dunn’s post-hoc test investigating the pairwise differences in task interest/value sub-process. It indicates that the showing interest in or recognising the value of a learning task is significantly different between state and effect uncertainty ( $p = 0.008$ ), and between state and response uncertainty ( $p = 0.001$ ). The difference between effect and response uncertainty was not statistically significant.



**Figure 5.11: Post-hoc test using Dunn’s Test with Bonferroni Correction investigating the pairwise differences in Task Interest/Value**

Mann Whitney U post hoc test was conducted to examine the magnitude of difference between the state – effect uncertainty ( $U = 32$ ,  $p = 0.002$ ) and state – response uncertainty ( $p < 0.001$ ). The  $p < 0.001$  at state uncertainty – response uncertainty indicates that the chance of having a sample with a test statistic of 20.73, with no difference in population is almost zero. Comparison of mean ranks reveal that task interest/value is higher during perception of effect uncertainty as compared to state uncertainty (**Table 5.11**)



**Table 5.11: Mann- Whitney U Test for Task Interest/Value**

	Type of Uncertainty	N	Mean Rank	Sum of Ranks
<b>Task Interest/Value</b>	State Uncertainty	9	8.56	77.00
	Effect Uncertainty	23	19.61	451.00
	Total	32		
	State Uncertainty	9	5.00	45.00
	Response Uncertainty	7	13.00	91.00
	Total	16		

### 5.3.2.2 Hypothesis 2 - The choice of learning strategies related to performance SRL sub-process depends on the type of PEU

As per Zimmerman's (2000) SRL model, the performance phase consists of four subprocesses: Task strategies, elaboration strategies, critical thinking, and help seeking. Task strategies refers to the learner's ability of using a range of learning strategies based on the requirements for learning. Elaboration strategies refers to a learner's ability to apply their learning in wider contexts. Critical thinking refers to the aptitude for objectively evaluating and analysing the learning needs based on the situation. Help seeking is the ability to call upon one's social networks, colleagues, or experts in their area to enhance their knowledge. Kruskal Wallis hypothesis test was carried out to determine whether there were significant differences in the way learners employed the performance strategies depending on the type of uncertainty they perceived. **Figure 5.12** presents summary of hypothesis tests carried out for performance sub-processes.

Hypothesis Test Summary			
	Null Hypothesis	Test	Sig. Decision
1	The distribution of ElaborationStrategis_Avg is the same across categories of TypeOfUncertainty.	Independent-Samples Kruskal-Wallis Test	.130 Retain the null hypothesis.
2	The distribution of TaskStrategies_Avg is the same across categories of TypeOfUncertainty.	Independent-Samples Kruskal-Wallis Test	.193 Retain the null hypothesis.
3	The distribution of CriticalThinking_Avg is the same across categories of TypeOfUncertainty.	Independent-Samples Kruskal-Wallis Test	.057 Retain the null hypothesis.
4	The distribution of HelpSeeking_Avg is the same across categories of TypeOfUncertainty.	Independent-Samples Kruskal-Wallis Test	.475 Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

**Figure 5.12: Hypothesis summary of Kruskal Wallis test comparing Performance sub-processes across different types of PEU**

No significant differences were found in any of the performance sub-processes - elaboration strategies ( $X^2 = 4.079$ ,  $p = 0.13$ ,  $df = 2$ ), task strategies ( $X^2 = 3.287$ ,  $p = 0.193$ ,  $df = 2$ ), critical thinking ( $X^2 = 5.717$ ,  $p = 0.57$ ,  $df = 2$ ) and help seeking ( $X^2 = 1.488$ ,  $p = 0.475$ ,  $df = 2$ ). Thus, the null hypothesis –  $H_0$  that performance sub-processes of SRL are equal across all three types of PEU, was accepted based on these results. Therefore, no further post hoc tests were needed

### 5.3.2.3 Hypothesis 3 - The choice of learning strategies related to self-reflection SRL sub-process depends on the type of PEU

According to Zimmerman's (2000) framework, the self-reflection phase has two sub-processes – self-satisfaction and self-evaluation. Self-satisfaction is the sense of contentment one feels with their learning accomplishments, and which motivates them to further their learning goals. Self-evaluation refers to the ability of a learner to identify their own strengths and weaknesses so as to develop their skills and abilities to enhance their strengths and address their weaknesses. Kruskal Wallis hypothesis test was carried out to determine whether there were significant differences in the way learners experienced self-satisfaction and undertook self-evaluation based on the type of uncertainty they perceived. **Figure 5.13** presents summary of hypothesis tests carried out for self-reflection sub-processes.

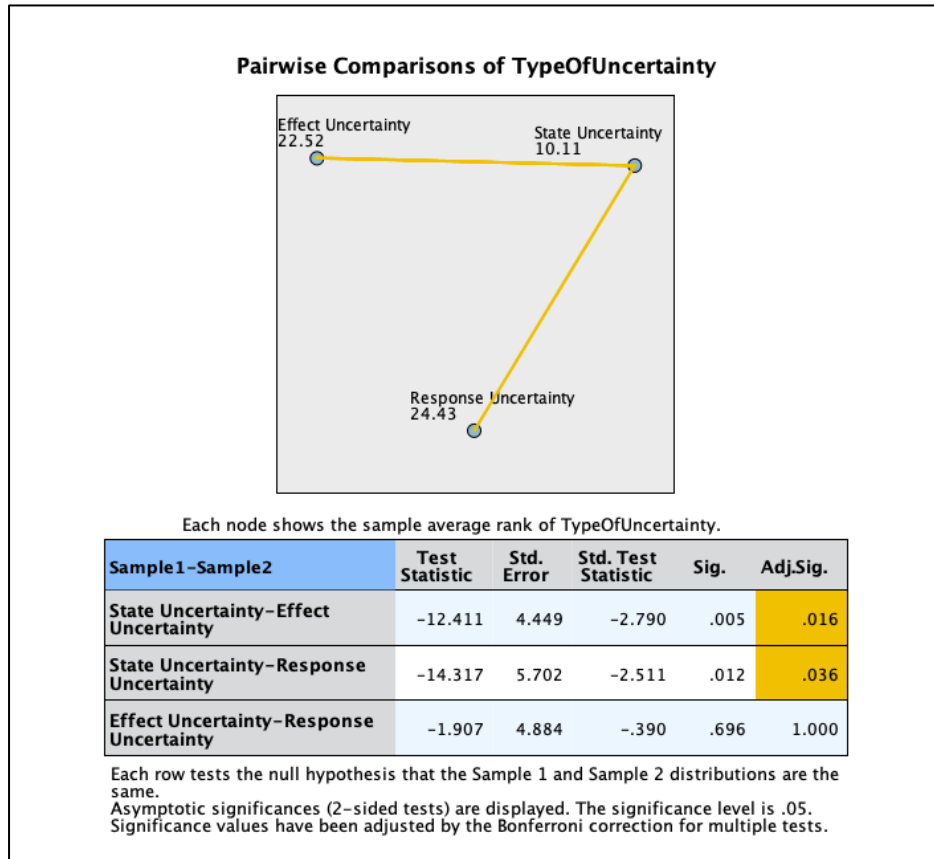
Hypothesis Test Summary				
	Null Hypothesis	Test	Sig.	Decision
1	The distribution of SelfEvaluation_Avg is the same across categories of TypeOfUncertainty.	Independent-Samples Kruskal-Wallis Test	.011	Reject the null hypothesis.
2	The distribution of SelfSatisfaction_Avg is the same across categories of TypeOfUncertainty.	Independent-Samples Kruskal-Wallis Test	.008	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

**Figure 5.13: Hypothesis summary of Kruskal Wallis test comparing Self Reflection sub-processes across different types of PEU**

Self-evaluation ( $X^2 = 9.088$ ,  $p = 0.01$ ,  $df = 2$ ,  $\epsilon^2 = 0.239$ ) and self-satisfaction ( $X^2 = 9.595$ ,  $p = 0.008$ ,  $df = 2$ ,  $\epsilon^2 = 0.253$ ) were both significantly different across different types of uncertainties. Thus the null hypothesis –  $H_0$  that self-reflection sub-processes of SRL are equal across all three types of PEU, was rejected based on these results and further post hoc tests were carried out to examine these differences (**Figure 5.14 and Figure 5.15**).

**Figure 5.14** shows results from Dunn's post-hoc test investigating the pairwise differences in self-evaluation sub-process. It shows that ability learner's self-evaluation is significantly different between state - effect uncertainty ( $p = 0.016$ ) and between state – response uncertainty (0.036). The difference in self-evaluation was not significantly difference between effect – response uncertainty.



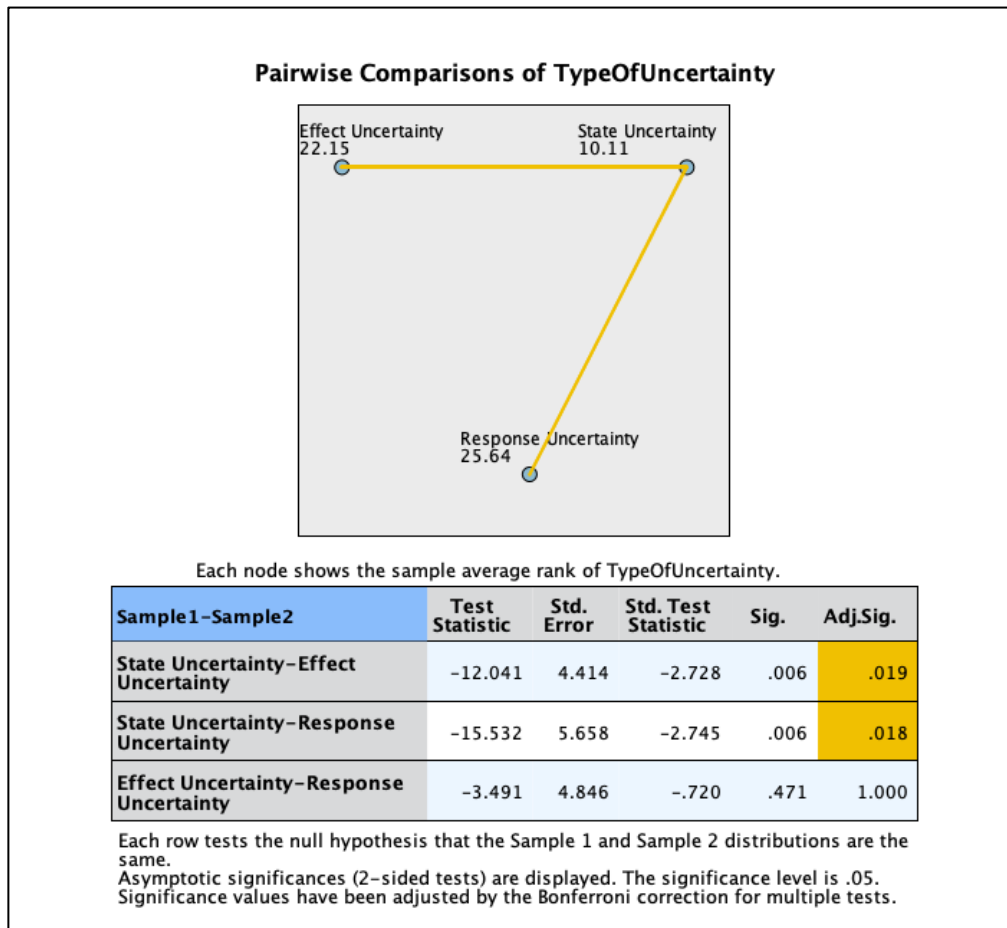
**Figure 5.14: Post-hoc test using Dunn's Test with Bonferroni Correction investigating the pairwise differences in Self-Evaluation**

Mann Whitney U post hoc test was conducted to examine the magnitude of difference in self-evaluation between the state – effect uncertainty ( $U = 38.5$ ,  $p = 0.005$ ) and state – response uncertainty ( $U = 7.5$ ,  $p = 0.008$ ). Comparison of mean ranks reveal that self-evaluation is higher during perception of effect uncertainty and response uncertainty as compared to state uncertainty. It is highest during perception of effect uncertainty (Table 5.11).

**Table 5.12: Mann- Whitney U Test for Self-evaluation**

	Type of Uncertainty	N	Mean Rank	Sum of Ranks
Self-evaluation	State Uncertainty	9	9.28	83.50
	Effect Uncertainty	23	19.33	444.50
	Total	32		
	State Uncertainty	9	5.83	52.50
	Response Uncertainty	7	11.93	83.50
	Total	16		

**Figure 5.15** shows results from Dunn’s post-hoc test investigating the pairwise differences in self-satisfaction sub-process. It shows that ability learners’ sense of contentment that fuels their motivation to further their learning goals is significantly different between state - effect uncertainty ( $p = 0.019$ ) and between state – response uncertainty (0.018). The difference in self-satisfaction was not significantly difference between effect – response uncertainty.



**Figure 5.15: Post-hoc test using Dunn’s Test with Bonferroni Correction investigating the pairwise differences in Self-Satisfaction**

Mann Whitney U post hoc test revealed the magnitude of difference in self-satisfaction between the state – effect uncertainty ( $U = 39$ ,  $p = 0.006$ ) and state – response uncertainty ( $U = 7.0$ ,  $p = 0.008$ ) was statistically significant. Comparison of mean ranks reveal that self-satisfaction is higher during perception of effect uncertainty and response uncertainty as compared to state uncertainty. Similar to self-evaluation, it is highest during perception of effect uncertainty (**Table 5.11**).

**Table 5.13: Mann- Whitney U Test for Self-satisfaction**

	Type of Uncertainty	N	Mean Rank	Sum of Ranks
<b>Self-satisfaction</b>	State Uncertainty	9	9.33	84.00
	Effect Uncertainty	23	19.30	444.00
	Total	32		
	State Uncertainty	9	5.78	52.00
	Response Uncertainty	7	12.00	84.00
	Total	16		

### 5.3.3 Summary of Quantitative results

Table 5.14 presents a summary of all the Kruskal Wallis hypothesis tests conducted to answer RQ2.1.

**Table 5.14: Summary of Kruskal Wallis Hypothesis test with Effect Sizes**

	Total N	Test Statistic	Degrees of freedom	Significance Level (2-sided test)	Epsilon Squared	Effect Sizes
<b>Forethought</b>	39	10.659	2	0.005*	0.281	Relatively Strong
<b>Performance</b>	39	4.723	2	0.094	0.124	
<b>Self-reflection</b>	39	10.214	2	0.006*	0.269	Relatively Strong
<b>SRL_Tot</b>	39	7.569	2	0.023*	0.199	Relatively Strong
<b>UA_Tot</b>	39	0.453	2	0.798	0.012	
<b>Strategic Planning</b>	39	9.301	2	0.01*	0.245	Relatively Strong
<b>Self-Efficacy</b>	39	4.952	2	0.084	0.13	
<b>Goal Setting</b>	39	10.46	2	0.005*	0.275	Relatively Strong
<b>Task Interest/Value</b>	39	14.346	2	0.001**	0.378	Strong
<b>Elaboration Strategies</b>	39	4.079	2	0.13	0.107	
<b>Task Strategies</b>	39	3.287	2	0.193	0.087	
<b>Critical Thinking</b>	39	5.717	2	0.57	0.15	

<b>Help Seeking</b>	39	1.488	2	0.475	0.039	
<b>Self-Evaluation</b>	39	9.088	2	0.01	0.239	Relatively Strong
<b>Self-Satisfaction</b>	39	9.595	2	0.008	0.253	Relatively Strong
<b>Rea and Parker (1992) – Kruskal Wallis Effect Size estimates</b>						
<b>0.00 &lt; 0.01 - Negligible</b>						
<b>0.01 &lt; 0.04 - Weak</b>						
<b>0.04 &lt; 0.16 - Moderate</b>						
<b>0.16 &lt; 0.36 - Relatively strong</b>						
<b>0.36 &lt; 0.64 - Strong</b>						
<b>0.64 &lt; 1.00 - Very strong</b>						

**Table 5.15** presents the summary of the three hypotheses tested in Study 2.

**Table 5.15: Hypothesis Test Result**

<b>Hypothesis</b>	<b>Result</b>
H <sub>0</sub> 1: The forethought sub-processes of SRL are equal across all three types of PEU.	Rejected
H <sub>0</sub> 2: The performance sub-processes of SRL are equal across all three types of PEU.	Fail to reject
H <sub>0</sub> 3: The self-reflection sub-processes of SRL are equal across all three types of PEU	Rejected

**Table 5.16** presents a summary of all the post hoc tests conducted to examine the pairwise comparisons for all significant differences found in Kruskal Wallis hypothesis test.

**Table 5.16: Summary of post hoc tests – pairwise comparisons**

Variable	Pairwise comparison between types of perceived uncertainty	Comparing post hoc test results		
		Kruskal Wallis (Dunn- Bonferroni correction)	Mean Rank (Mann Whitney U pairwise comparison)	Pairwise Mann Whitney U with Bonferroni adjustment
<b>SRL_Tot</b>	State uncertainty – Effect Uncertainty	0.024*	9.61 19.2	0.008**
	State Uncertainty – Response Uncertainty	0.106	Not tested	Not tested
	Effect Uncertainty – Response Uncertainty	1	Not tested	Not tested
<b>Forethought</b>	State uncertainty – Effect Uncertainty	0.024*	9.61 19.2	0.008*
	State Uncertainty – Response Uncertainty	0.007	5.22 12.71	0.001**
	Effect Uncertainty – Response Uncertainty	0.737	Not tested	Not tested
<b>Self-Reflection</b>	State uncertainty – Effect Uncertainty	0.013*	8.83 19.5	0.003*
	State Uncertainty – Response Uncertainty	0.016*	5.78 12	0.008*
	Effect Uncertainty – Response Uncertainty	1	Not tested	Not tested
<b>Strategic Planning</b>	State uncertainty – Effect Uncertainty	0.008*	8.61 19.59	0.002*
	State Uncertainty – Response Uncertainty	0.094	Not tested	Not tested
	Effect Uncertainty – Response Uncertainty	1	Not tested	Not tested
<b>Goal Setting</b>	State uncertainty – Effect Uncertainty	0.258	Not tested	Not tested
	State Uncertainty – Response Uncertainty	0.004	5.56 12.29	0.003*



	Effect Uncertainty –	0.081	Not tested	Not tested
	Response Uncertainty			
<b>Task Interest/Value</b>	State uncertainty –	0.008	8.56	0.002*
	Effect Uncertainty		19.61	
	State Uncertainty –	0.001	5	0.0000**
	Response Uncertainty		13	
	Effect Uncertainty –	0.417	Not tested	Not tested
	Response Uncertainty			
<b>Self- Evaluation</b>	State uncertainty –	0.016*	9.28	0.005**
	Effect Uncertainty		19.33	
	State Uncertainty –	0.036*	5.83	0.01*
	Response Uncertainty		11.93	
	Effect Uncertainty –	1	Not tested	Not tested
	Response Uncertainty			
<b>Self- Satisfaction</b>	State uncertainty –	0.019*	9.33	0.006*
	Effect Uncertainty		19.3	
	State Uncertainty –	0.018*	5.78	0.008*
	Response Uncertainty		12.00	
	Effect Uncertainty –	1	Not tested	Not tested
	Response Uncertainty			

The next sub-section presents the results from qualitative secondary data analysis.

## 5.4 Results – RQ 2.2

### 5.4.1 Descriptive summary of data

The data from the primary study consisted of 30 interviews. Analysis of work tasks (based on steps shown in Figure 5.4) revealed that the work situations mentioned by four participants did not match with Milliken's (1987) definitions of PEU. For example, **Participant 19** had to carry out an assurance review on a subject that they did not have any previous experience. However, they clearly stated that they did not perceive this change as uncertainty:

Well, the purpose of the review was quite clearly defined, so that was my guide, you know I had to make sure I understood the subject matter of the review and what the review was aiming to achieve. So, the review was quite clearly scoped out for me, so it was quite a simple

job of just getting into those areas which I didn't have an earlier experience of and getting myself up to speed. (**Participant 21**)

Similarly, **Participant 14** had to learn a new risk module that was introduced within the organisation. Nevertheless, they did not perceive it as an uncertainty, as they were confident about the resources provided by the organisation to support their learning. There were two more cases which were similar to the examples given above. Hence these four situations were excluded from SDA. Finally, there were 26 interview transcripts which were included in the secondary analysis.

Deductive coding of types of uncertainty and sources of uncertainty revealed 5 examples of environmental influences, 1 example of political strategies, 1 example of the financial crisis, 16 examples of structural changes, and three examples of technological changes. The following table presents a summary of the classification of each of these examples into the types of PEU as per Milliken's (1987) framework.

**Table 5.17: Classification of secondary data into types and sources of perceived uncertainty**

Serial Number	Participant ID	Type of PEU			Sources of Uncertainty				
		State Uncertainty	Effect Uncertainty	Response Uncertainty	Environmental Influences	Political Strategies	Financial Crises	Structural Changes	Technological changes
1	1	✓			✓				
2	2	✓	✓			✓	✓		
3	3		✓					✓	
4	4	✓		✓				✓	
5	5			✓				✓	
6	6	✓							✓
7	7	✓						✓	
8	9			✓				✓	
9	10			✓				✓	
10	11	✓						✓	
11	12			✓				✓	
12	13	✓	✓	✓				✓	
13	14	✓		✓				✓	
14	17		✓		✓				
15	18		✓	✓	✓				

16	19			✓				✓	
17	20			✓		✓			
18	22			✓				✓	
19	23		✓	✓	✓				
20	24			✓				✓	
21	25			✓				✓	
22	26	✓							✓
23	27	✓							✓
24	28	✓	✓					✓	
25	29		✓		✓				
26	30			✓				✓	

As expected, the perception of uncertainty was not singular. There were examples with multiple sources of uncertainty which were perceived at different levels. For example – the situation shared by **Participant 2** pertained to ‘major politically inspired regulatory changes that came into the market’, which could be classified as state uncertainty at organisational level. At an individual level, they experienced effect uncertainty, as they were uncertain about the changing regulations and the ‘impact of that change on having a knock-off effect on markets, technology change, or procedural change’.

The following section presents the results from the thematic analysis of the interview data. As the research did not aim to address gender differences pertaining to learning strategies, a purposeful decision was taken to use gender-neutral pronouns (they, their, and them) throughout the analysis.

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#### **5.4.2 Findings – Thematic Analysis of secondary data**

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**RQ 2.2** looked into the range of learning strategies used by professionals when they perceived uncertainty. Since secondary data analysis was undertaken to enable triangulation of results, the themes identified for learning strategies were mapped against the closest type of PEU to see if there were any notable differences. As noted in **Section 5.2.2.2**, thematic analysis approach was adopted to analyse the secondary interviews. While analysing it was clear that there were some similarities and distinctions in the learning strategies employed by professionals based on their dominant perceived uncertainty. Hence the results are presented in the form of commonalities and differences across the three types of PEU.

##### **5.4.2.1 Commonalities in learning strategies across all three types of PEU**

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Irrespective of the type of uncertainty perceived, following four themes were coded across all types of PEU:

##### **Networking and information sharing**

Networking was a prominent theme across all the 26 interviews. Professionals practiced networking by not merely attending a networking event in their field but also by building mutually beneficial relationships over a period of time. Participants recognised the importance of networks within their organisation as much as outside their workplace. Findings showed that both experienced professionals and novices relied on their informal connections at the workplace and beyond when they wanted to feel the pulse of a developing uncertainty situation within their organisation or seek advice on an existing uncertainty situation. For instance, **Participant 3’s** perceived effect uncertainty was surrounding how the changed regulations would impact client assets.

So, I had to actually go out and understand who's regulated by the deposit regulation, who's regulated by client assets. So that was difficult in itself. So that was going out and understanding the business and how I learned that was just by going out and speaking to people. We also got a team in of people what we call subject matter experts, who would know that business a bit better than myself to actually explain how that business worked.

**(Participant 3, PEU – Effect uncertainty)**

During situations of extreme environmental uncertainty, participants described networking or communicating with people from other organisations to help each other reduce the perception of uncertainty. This is evident from an example shared by **Participant 20**. They agreed that during normal times, “financial markets are very competitive, and most people compete like mad to do the best deal, make the money and so on and so forth”. However, whenever an extraordinary event happened and introduced uncertainty into the system, people come together:

...it's in nobody's interest if one professional body doesn't know what the problem is. So, I'll be sharing that example with the chartered bankers, with the accountants and so on and where there's something that could upset the whole industry in financial markets people are amazingly willing to share that kind of information. **(Participant 20, PEU – Response uncertainty)**

Though networking was deemed as an important strategy for learning in uncertainty, professionals were hesitant to reach out to people online.

Purely because of my own limitations on social networking, maybe if I get a bit more confident about that it might have been the thing that personally I would have asked for other people's experience or best practice. **(Participant 14, PEU – State and Response uncertainty)**

### **Seeking help from peers and colleagues**

Closely related to networking was the strategy to seek help from peers and colleagues. Like networking, seeking help from peers and colleagues was also observed in all 26 interviews, irrespective of the type of uncertainty they perceived.

For example, **Participant 6's** situation referred to the adoption of a new database warehousing system called Teradata. They were tasked with understanding the new technology that they had not seen or

used before. After trying to find out things from 'ad hoc documents and presentations', they found that talking to people directly was the most helpful strategy.

so I actually had a contact who was doing something similar with the same tool in another division and I picked up the phone to him occasionally and had a chat about how Teradata worked and certainly on the data loading I spoke to him quite a bit about that then as well. So, I think most of the architecture overview was personal information from contacts, consultants or technology people. (**Participant 6, PEU – State uncertainty**)

However, in some instances it looked like help seeking was used by professionals more as a means to an end – to fulfil the work objective rather than to learn.

...to do that was learning, but that wasn't my thought of it, it was just I need to go and speak to these people to get as much information as possible so I can complete that objective.

(**Participant 3, PEU – Effect uncertainty**)

The help-seeking strategy was not just limited to novices or junior level practitioners but was also reported by senior management. For example, **Participant 12** acknowledged that after reaching a senior level, they did not place emphasis on taking input from others. However, during organisation restructure, when they were uncertain about the new environment and changing culture, they realised the importance of talking to people and taking suggestions before making any decisions.

You get to a stage I think where you don't want to hear other people's views, I know that doesn't sound right, but that's just the way things happen sometimes when you're at a certain level, but I think what I've learned in the last year.... I'm now taking information and input, throwing it out there, you know use a whiteboard or whatever and try to work out maybe there's a better way of doing this. (**Participant 12, PEU – Response uncertainty**)

### **Self-learning through technology**

This theme indicated learning undertaken by professionals of their own volition to fill in the knowledge gaps that triggered their perception of uncertainty. It was mentioned in 23 out of 26 interviews. In the case of technology used for learning, they mentioned using Google, Twitter, and LinkedIn (mostly for networking purposes). This was mainly used as a complementary strategy to help-seeking and networking. For instance, when **Participant 14** accepted the position of 'Head of strategic implementation', one of the biggest uncertainties was the expectations from their role. They had to take complete ownership of the institute's business plan, which was a completely new arena for

them. Their first go-to strategy was talking to key people, and then they went on Google to learn more about the new domain area.

...in order to know what I didn't know I worked a little bit with the leadership team to find out what they strategically wanted to achieve through the business plan. So, they still had the responsibility of setting the strategic objectives, I then faced with that, I went and went where most people start their learning, I would imagine these days, I went online, I went on to Google. **(Participant 14, PEU – Response uncertainty)**.

Even though networking and talking to people was seen as the most prominent learning strategy when the professionals need to gather high-level information about an uncertain situation when the need arose for learning something specific, professionals reported conducting online research, as reported by **Participant 1 and Participant 18:**

So, in going about drawing the information I had some accumulated knowledge, but then through talking to people, people recommended books, a lot of the research is done online looking at various sources, comparing, contrasting and trying to get to some sort of bedrock of truth. So, it's predominantly online research and reading books. **(Participant 1, PEU – State uncertainty)**

So, I always do a bit of research, I've got certain websites that I always look at. So, for banks the regulators websites are important because they do review, very often they'll have a review on a subject that I'm looking at and they'll tell you what they found was good and what they found was bad. **(Participant 18, PEU – Effect uncertainty)**

Technological platforms such as Yammer, intranet blog sites, office 365 environments were also mentioned as useful tools for knowledge sharing.

What we try to do is on a weekly basis have a knowledge sharing session where you actually bring everybody together because a solution you may find in one field may be applicable in another field and unless you actually force the cross fertilisation it does not happen. So we are, right now, we've been exploring Yammer and other social networking blogs, Twitter, or the equivalent to try and get people in to the habit of sharing their findings because what tends to happen is people always solving problems at the micro or major level and so at very simple levels people may have found a really neat trick to do on Excel, but it hasn't necessarily spread to the whole company. **(Participant 17, PEU – Effect uncertainty)**



## Flexible approach to learning

A common theme that was found during the analysis was that the professionals did not always have a structured approach to learning. Learning could be both structured and flexible. They expressed the importance of having a flexible approach to learning due to the inherent uncertainty in the workplace. 19 out of 26 professionals indicated the need to have a flexible approach to learning. As mentioned by **Participant 2**, when talking about how they learnt to manage the aftereffects of the 2008 financial crisis.

It's influenced by a major issue, for instance in 2008 we had the financial crisis and pretty much most of what we were planning to do hit a brick wall and we went into a different direction, which was around the financial crisis ..... So, it's difficult to plan accurately, that's why flexibility and being agile in reacting to changing events is part and parcel of the job.

**(Participant 2, PEU - State and Effect uncertainty)**

The above example was a macro-level uncertainty. However, the flexibility in learning was noted even in micro-level uncertainty. For example, at the beginning of their career when **Participant 25** was trying to understand the intricacies of their job role, they faced a very uncertain situation. As they had not completely become operational in the new role, their new boss had given a very clear rule to follow in his absence: 'you are still relatively new in the team, if you are asked to do such things as intervening with a client at the moment you should not do that because you're not ready, so do not hesitate to say no'. However, once when their boss was away, they were called upon to make a presentation to a very important client. They were extremely uncertain as to what their response should be as their boss had given a clear/no exception rule that they should not interact with any clients. Yet, the stakes and consequences in terms of business were too high for them to refuse to make the presentation.

But I learnt also that sometimes no matter how clear the rules are because I really had a very clear rule...I must say in 15 years of work I never had such a clear rule said to me and no matter how clear the rule is there is always, always, always a situation where business requirements are unpredictable and you may have to infringe the rule, even if you are starting in a company, even if you are not senior enough and so on and so on. **(Participant 25, PEU – Response uncertainty)**

They addressed this uncertainty situation, through a range of strategies – seeking help from seniors, looking up information for the presentation, drawing a mind-map for the approach they were presenting. In the end, while self-reflecting on their experience, they attributed their success to their

‘flexible approach’ and said that “I did the best I could to make the meetings go well. Yeah and it went very well, so at the end of the day I think it was the right way to proceed, but I learnt a lot from this experience” (**Participant 25**).

#### 5.4.2.2 Differences in learning strategies across the three types of PEU

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##### Reflection

Reflection involves an investigation of one's actions pertaining to a particular situation to draw insights for future situations. The examples of reflections coded in the interviews were mostly related to situations of response or effect uncertainty. 15 out of 26 professionals mentioned undertaking some sort of reflection to learn from their uncertainty or to draw from previous experiences. There was one example related to an organisational change which was triggered when a senior manager, who had a very traditional and conservation management styled, retired from his post. The new manager came from a different organisation and had a completely liberal management style. The leadership team had mixed reactions to this change, as there were too many changes happening, and they did not know how to respond to those changes.

So, during my period of reflection, what I learnt was the subtlety of his approach and how he introduced this learning, or this change and how he got the buy in for the implementation of it. (**Participant 28, PEU – Effect uncertainty**)

Examples of reflection were not just of self-reflection as defined in Zimmerman's (2000) framework, but reflective practice embedded in social interaction with team members. Continuing the above example, **Participant 28** carried out self-reflection along with social reflection with team members:

different conversations with different members of my peer group and it was round about what it meant to them, what they had taken from that meeting, how they could see this thing working in the future. So probably starting almost immediately on a period of reflection or investigation with my peer group. (**Participant28, PEU – Effect uncertainty**)

However, some professionals failed to distinguish between self-reflection with a formal record of professional development activities. When asked 'did you self-reflect on your learning, after the situation?', their answer was:

That's actually done by default in some ways, in that the system I was talking about has a CPD element to it as well.... So, I record everything that I do. (**Participant 19, PEU – Response uncertainty**)

## **Self-evaluation**

Self-evaluation is the process of examining one's performance in order to improve it. It was reported as a common practice in most workplaces for professionals to conduct their annual self-evaluations and discuss the outcomes of these evaluations with their line manager. It was coded in 15 interviews. When the professionals perceived effect or response uncertainty, self-evaluation was reported as being an important guiding tool rather than just a tick-box activity. For example, when **Participant 5** was entering a new role with limited experience of what to expect, they were unsure about the demands of their new role and its impact on their performance. They considered it to be beneficial to proactively identify their performance criteria and then evaluated themselves against each of those predefined criteria.

Yes, I sort of mapped my experiences and skills against what I thought was required for this. I identified two areas where I certainly didn't have the skills or the experience and so these were the key priorities to learn about. (**Participant 5, PEU – Response uncertainty**)

There was also an example where self-evaluation undertaken by the professional did not lead to a positive outcome. **Participant 13** had taken on a new role and was asked to draft a letter to the FCA, which was a daunting task as it required proficiency in the legal terms which **Participant 13** did not know at the time. They drafted the letter after taking help from peers, talking to people from the legal team, and doing their own research online. However, they received terrible feedback from their manager. Their self-evaluation discussion with their manager led to reduced interest in future learning tasks.

So did I feel capable - no, not after that because whenever anything else came up I immediately fell back to that instance and thought well whatever I produce is either going to be ripped apart by committee or somehow the joy of achievement has been sullied slightly by that. It sounds very dramatic, it obviously wasn't quite as dramatic as that, but it does tend to take out some of your enthusiasm. (**Participant13, PEU – Effect uncertainty**)

## **Strategic planning**

Strategic planning refers to a learners ability to identify a need for learning and undertaking purposive actions to undertake that learning. Professionals undertook strategic planning predominantly

when they perceived response uncertainty. For example, **Participant 22** had accepted a new role as investment complaint manager at <retail bank>. It required having significant amount of niche knowledge about endowments, protection etc. Knowing what to expect from the new job, and to self-learn in a new environment was the uncertainty for them. They identified the learning that needed to undertake to perform the new role and took specific actions to achieve that goal.

I had to do my own self-learning.... so I took it on myself to say I'm going to visit Halifax for 3 days, work shadow one of the path advisors who's got 10 years of experience and then I'd sit in on a live situation for a day or two to experience how it works and have somebody next to me that had done it for 10 years. So, it was all a bit of self-learning and self-development for the benefit of the colleagues, myself and the customers. (**Participant 22, PEU – Response uncertainty**)

Similarly, when **Participant 19** was moved to a compliance management role during organisational restructuring, they confessed that 'I had no knowledge whatsoever really'. After initially being hesitant with the uncertainty of the new domain and role, they decided to take a 'structured approach' to reduce the uncertainty:

What I did was, at the very, very start, in the first month, I had to look at what knowledge was available to me. I looked at what the best practice was particularly within this complex compliance website and then I drove that down because the compliance website covered more areas than we were involved in at the time, so I narrowed down what was relevant to our business, then from there tried desperately to map as quickly as I could where the gaps were in what we were doing compared to what the best practice would be in an ideal world. (**Participant 19, PEU – Effect and response uncertainty**)

However, in some cases, the examples of strategic planning were coded in the context of team planning rather than at an individual level. Since finance professionals do not typically work in silos, perception of uncertainty was most at a team or departmental level rather than individual level.

**Participant 17's** client in Jamaica wanted to add a product about a critical illness to an existing product suite. However, since it was a new product in the 'developing world' they did not have statistical information on the performance of that product, or about regulators perception of it. Hence there were major knowledge gaps that they had to implement of this new product. This could be categorised as effect uncertainty at the team level. Hence, strategic planning activities were undertaken

wherein they “put together a planning group to come up with the plan.” (**Participant 17, PEU – Effect uncertainty**).

## 5.5 Triangulating qualitative and quantitative results - RQ2

As explained in **Section 3.2.3**, quantitative questionnaire data and qualitative interview data were mixed using Creswell's (2003) concurrent triangulation method, i.e., analysis was conducted at the same time, to answer **RQ2**. Triangulating qualitative and quantitative results presented a comprehensive view of the ‘learning in uncertainty’ phenomenon being researched. This increased the rigour in research design as compared to any single method research design (Kelle, 2006).

**Table 5.18** presents a summary of the most prominent learning strategies that emerged from the study:

**Table 5.18: Combination of learning strategies from LiU survey and SDA**

Learning strategies from LiU survey	Learning strategies from SDA
<b>Similarities across types of PEU</b>	
Self-efficacy	Networking with external networks/professional bodies
Elaboration strategies	Seeking help from peers and colleagues
Task strategies	Self-learning through technology
Critical thinking	Flexible approach to learning
Help seeking	
<b>Differences across types of PEU</b>	
Strategic planning	Reflection
Goal setting	Self-evaluation
Task interest/Value	Strategic planning
Self-evaluation	
Self-satisfaction	

SDA of interviews revealed four themes which were common across all types of perceived uncertainty. One of the most prominent findings from the analysis was the importance of interacting with people during uncertainty. There were two themes that led to this finding – 1) interacting with people outside the organisation, such as members of a professional body. This was categorised as networking. 2) Interacting with peer and colleagues within the organisation was found to be the second most common theme. Both these themes map to the help-seeking strategy which was found to

be a commonly used strategy irrespective of the type of PEU in the quantitative analysis. After networking and help-seeking, the third most prominent theme seen in all the interviews was self-learning undertaken by professionals through the use of technology. Professionals reported various examples of technology which they used for knowledge sharing and acquisition during times of uncertainty. Common examples were Google, LinkedIn, Twitter, Yammer, and similar social learning platforms. The self-learning, they undertook using various platforms could be mapped to the task strategies sub-process from the quantitative findings as it refers to the ability of a learner in using a wide range of learning strategies based on the need for learning. It also could be mapped to the flexible approach to learning which was commonly reported by professionals. They noted that constant change and uncertainty was inherent in their day to day job, due to which they could not have a planned or adopted a structured approach to learning. They valued a flexible approach to learning which helped them achieve their learning objectives in times of uncertainty.

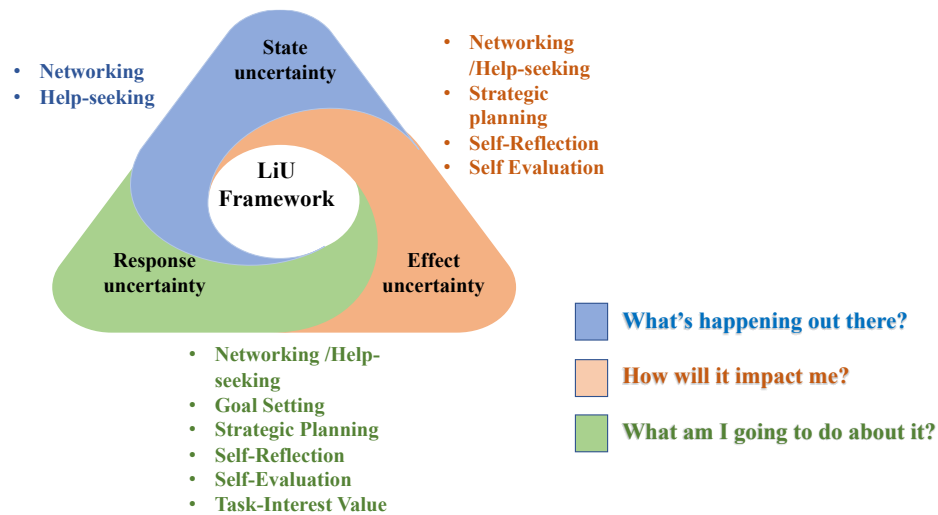
SDA revealed three themes which differed across the three types of PEU. Reflection and self-evaluation were undertaken when perceiving response or effect uncertainty, while strategic planning was undertaken predominantly when the professionals experienced response uncertainty. This was similar to the findings from quantitative analysis as the pairwise comparison for self-evaluation and self-satisfaction were found to be significantly different in the state -effect and state – response PEU. According to Zimmerman's (2000) framework, these sub-processes were categorised under the self-reflection phase. The only difference between quantitative and qualitative findings was that goal setting, and task interest/value were found to be significantly more when perceiving effect or response uncertainty. These differences were not prominently revealed in the thematic analysis of interviews.

## **5.6 Learning in Uncertainty (LiU) Framework**

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Findings from Study 1 provided some in-depth insights into the antecedents, consequences, and nature of uncertainties faced by finance professionals. It also provided a typology of the typical sources of environmental uncertainties in the finance sector. One thing that was clear from the results was that taking control of their own learning was recognised as an important factor for dealing with times of uncertainty. The relationship between learning and perceived uncertainty was then explored in Study 2, which tested the hypothesis that the learning strategies were specific to the type of uncertainty perceived by the professionals. In Study 2, Zimmermann's (2000) SRL framework was used to operationalise learning undertaken by professionals in uncertainty. Using a mixed methods research design, Study 2 established that SRL strategies pertaining to forethought and self-reflection phases of Zimmerman's (2000) framework were more prominent when perceiving effect and response uncertainty respectively, while the social learning strategies such as networking and seeking help from peers and colleagues were important in all three types of PEU. The strategies pertaining to

performance phase, such as elaboration strategies, task strategies, critical thinking, and help-seeking were common throughout all types of uncertainty. **Figure 5.16** presents a graphical representation of the LiU framework which maps the dominant SRL strategies used for learning to the type of perceived uncertainty.

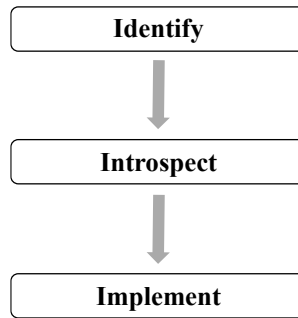


**Figure 5.16: Learning in Uncertainty framework**

Quantitative analysis of survey data did not reveal strategies specific for state uncertainty, however qualitative analysis of interviews found that networking and help-seeking were the most prominent strategies employed by professionals when they perceived state uncertainty. When professionals were uncertain about the impact of an environmental uncertainty or their response options, they resorted to forethought and self-reflection SRL strategies. For example, when perceiving effect uncertainty, they typically undertook strategic planning and self-reflection, apart from networking and help-seeking which were common strategies across all types of uncertainties. Professionals reported highest level of interest and value for learning when perceiving response uncertainty.

Analysing the individual work situations from the secondary data revealed that professionals employed three distinct steps when faced with uncertainty (**Figure 5.17**):

- 1) Identifying the knowledge gap/source of uncertainty
- 2) Introspecting on the skills/competency gap that needed to be filled to address the uncertainty
- 3) Implementing strategies to address the skills/competency gap to reduce the perception of uncertainty



**Figure 5.17: i3 approach to LiU**

The implement and introspect phases of the  $i^3$  approach draw parallels with the performance and self-reflection phases of Zimmerman's framework. In Zimmerman's SRL model, performance phase corresponds to the execution of the learning tasks identified and planned in forethought phase, while in the self-reflection phase, the learner assesses their performance and reflect on success or failure of the task. The order of phases is slightly changed when learning in uncertainty. On perceiving uncertainty, the first step is to identify the source of uncertainty, and the knowledge or skills gap if any that lead to the uncertainty. Then instead of directly implementing the strategies like in Zimmerman's framework, the learner introspects on their thoughts, actions, feelings, and experiences to formulate strategies for managing the perception of uncertainty. The implement phase relates to putting these strategies into action. For example, **Participant 30**, perceived response uncertainty as they were asked to take on a responsibility of organising high visibility, impact event, which they had not done before:

**Identify Uncertainty Situation:** “What I was asked to do was take on responsibility which was not originally within my remit and objectives for that year, both to take on the additional responsibility to organise an event on behalf of our chief risk officer, so that’s on behalf of a member of the executive, to organise what we call a senior leaders event.....we had a team of 4 people who used to do that type of thing, but those roles were made redundant within our function due to some cost savings.... So, while in the past I had attended some events like that, **I had never organised an event of that scale before**” (**Participant 30**)

After identifying the responsibilities and the requirement of the role, they did not immediately start planning for the event. Instead, they first introspected on the skills they have versus skills they lacked to organise the event and what they needed to learn.

**Introspect/Reflect:** “So myself and my colleague were pulled together to work on this jointly. So what both of us did is we sat down and looked at what are the stages that we need to organise to get this event pulled together and then from what the stages were, what are the



key elements within those stages that needed to do and then look at ok these are the stages, what skills have I got that can help with those stages and also where, for example, are **my skill gaps** and my colleague did the same because he brought different skills to it and I brought different skills to it. So, from that **what did I need to learn? What could I learn from him? What could I learn from my manager**, the senior manager involved? How could we also get direction on what the expectation was from the chief risk officer?" (Participant 30)

Having identified the gaps in skills and knowledge required to reduce their perception of response uncertainty, they implemented the strategies that they had identified in the introspection phase.

**Implement:** "So part of how I did my learning was to **talk to some other colleagues** in other divisions who I knew had previously organised events I had attended. .... So, part of it was all about how we could have a plan that would help us deliver things and where could we learn from other people in building our own plan.... So, at different points throughout, because there were various different things that we needed to learn, so there was a mixture of stuff that I used. So, **using networks, using my line manager to look at his experience, used brainstorming with another guy and my line manager**, the three of us, in terms of what would help us in this situation? What sort of ideas have we got that can be used? We also **used some resources that we have available internally**, but I know that you can get them **external, like Harvard online...** (Participant 30)

The LiU framework (**Figure 5.16**) and i3 approach to LiU (**Figure 5.17**) were created based on findings from Study 1 and Study 2. In Study 3, these conceptual frameworks and approach will be implemented into a technological framework and evaluated for perceived ease of use, perceived usability, and efficacy to foster SRL competency. The following section discusses the implications of findings from quantitative and qualitative analysis in the context of extant literature.

## 5.7 Discussion

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### 5.7.1 Implications of findings

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This study quantitatively and qualitatively examined the relationship between SRL and PEU. The review of literature revealed that although learning in uncertainty was a recurring theme throughout the literature. There was a limited understanding of the relationship between the two (Bohlinger et al., 2015a; Cullen et al., 2014; Lopes, 2010; Schmidt et al., 2014). In the context of uncertainty in lifelong learning, Baumert et al., (2000) asserted the role of SRL as a central element in the model of continuous acquisition of knowledge. However, not much is known about SRL behaviour

in times of uncertainty. This study aimed to address the gap by understanding how the ability to self-regulate one's learning was related to the type of uncertainty they perceived. Kruskal Wallis hypothesis test revealed that overall SRL scores were different across three types of PEU. Further investigation into the SRL macro-phases, revealed that the forethought and self-reflection phase was different across the types of PEU, while performance did not have significant differences. This means that the way professionals planned their learning activities, set goals to achieve the learning objective and the extent to which they valued the learning activity depended on the type of uncertainty they perceived. Similarly, their self-reflective learning processes also differed based on the type of perceived uncertainty. However, the wide range of strategies they undertook to achieve the learning goals, their critical thinking and help-seeking abilities were the same throughout, without a differential effect of type of PEU. These results are in line with the findings from McKelvie et al. (2011), where they used Milliken's (1987) framework to examine the relationship between PEU and entrepreneurial action. They found that different types of uncertainties generated alternative learning strategies for reducing the perception of uncertainty. By operationalising learning as SRL, the findings from this study extend the findings of McKelvie et al. (2011) by finding specific learning strategies significant for each type of uncertainty.

Previous research on SRL of finance professionals found three variables mediating the relationship between learning activities undertaken at workplace and learning opportunities available – Task interest or perceived value, task strategies, and self-evaluation (Milligan et al., 2015). Study 2 used the same survey instrument used by Milligan (2015) in the same context (finance professionals from CISI), with the only difference of uncertainty variable introduced by the uncertainty vignettes, and Milliken's (1987) perceived uncertainty scale. So, it can be argued that the learning strategies from Milligan's (2015) study were indicative of learning undertaken in normal conditions, while findings from Study 2 depict learning strategies used in uncertain times. The differences in the strategies found in both the studies allude to the possibility that the perception of uncertainty has an impact on the learning activities undertaken by professionals. Hence, future research is warranted to explore these differences and how organisations can support their employees to navigate through uncertain times.

Analysing the differences between forethought phase sub-processes revealed that professionals perceiving effect uncertainty were more likely to engage in strategic planning activities than those perceiving state or response uncertainty. Professionals were equally likely to report self-efficacy and goal-setting behaviour, irrespective of the type of uncertainty perceived. On the other hand, professionals perceiving response uncertainty were more likely to report a higher degree of importance and value of their learning activity undertaken during uncertainty. Performance phase sub-processes revealed that professionals perceiving effect uncertainty reported a higher ability to apply their learning in uncertainty in the wider contexts as compared to state and response uncertainty. This could relate to the higher degree of strategic planning undertaken in effect uncertainty. Conversely,

those perceiving state uncertainty were more likely to report a higher degree of critical thinking skills, as compared to those perceiving effect and response uncertainty.

Research suggests that self-reflection during periods of uncertainties or dilemmas presents a valuable opportunity for learning from experience. Self-reflection at work refers to thinking purposefully and deliberately about particular work experience and deriving valuable insights about one's intrinsic values, goals, and new knowledge gained during that experience (Desjarlais & Smith, 2011). Reflection was found to be one of the most prominent strategies related to learning in uncertainty, both in quantitative and qualitative findings. The qualitative investigation of the type of reflection practised by professional indicates that it closely relates to Schon's (1987) model of reflection, which he used to describe the ways in which professionals dealt with uncertainty. According to Schon's theory of reflection, professionals reflect in two ways – reflection-in-action and reflection action. The findings from this study showed that professionals reflected to become aware of the tacit knowledge from their past experiences in order to devise strategies for current uncertainties. This relates to the notion of learning from experience. Previous research suggests that once professionals have gained a certain amount of experience, the benefits of deliberately contemplating and drawing from those past experiences far outweigh the benefits of gaining more experience (Stefano et al., 2016). This research echoes these findings, as self-reflection and self-evaluation were found to be the most effective strategies employed by professionals when faced with effect uncertainty.

Findings from this study showed that informal means of communication such as networking, collaboration, information seeking, and help-seeking were the most efficient ways of learning during uncertainty at work. Networking was practiced by professionals by not merely attending every networking event in their field but by building mutually beneficial relationships over a period of time. They recognised the importance of network within their organisation as much as outside their workplace. Findings showed that both experienced professionals and novices relied on their informal connections at the workplace and beyond when they wanted to feel the pulse of a developing uncertainty situation within their organisation.

However, in some instances, it looked like help-seeking was used by professionals more as a means to an end – to fulfil the work objective rather than to learn. This relates to the informal learning literature (Eraut, 2004), where the learning undertaken at work is informal in nature. Literature has shown informal learning to be more frequent (Tynjälä, 2008) and often people are not aware that they are learning.

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### **5.7.2 Study limitations**

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The LiU survey provided a quantitative evaluation to establish that the type of perceived uncertainty impacted the SRL strategies adopted, and SDA of interviews provided more detailed insights into the type of learning undertaken in uncertainty.

However, there were substantial limitations associated with the quantitative study that limit the generalisability of the findings outside the CISI population. The first limitation relates to the choice of convenience sampling technique for survey dissemination over probability sampling techniques. Despite their limited generalisability potential, convenience sampling techniques are often employed in learning science due to the high costs associated with probability sampling. One way to mitigate this limitation in future research could be to conduct comparative study between different types of convenience samples given their prevalence. A second limitation in the survey analysis related to the disproportionate selection of the type of vignette. The small sample size coupled with the disproportionate distribution of vignette selection limits the generalisability of the findings even further.

There were also some limitations associated with use of secondary data. For example, as the data was already collected there was no control for follow-up questions or over selection of participants. Thus, the researcher could not influence the kind of details the participant provided rich data on.

The differences in the strategies found in both the qualitative and quantitative studies allude to the possibility that the perception of uncertainty has an impact on the learning activities undertaken by professionals. These differences can be unpacked in future research as it was not in scope for this study.

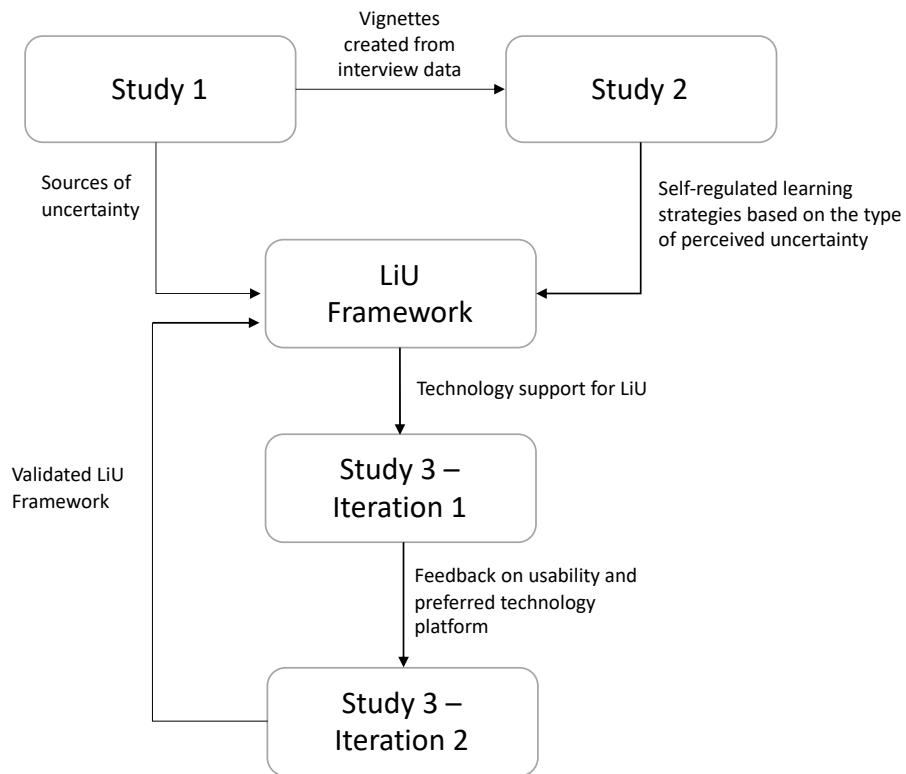
## **5.8 Conclusion**

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The overarching research objective of this study was to examine the SRL behaviour of finance professionals. A concurrent triangulation mixed methods design was employed to answer RQ2. The findings from this study augment the findings from previous research and broaden the knowledge of understanding SRL behaviour of professionals by showing that SRL behaviour itself is dependent on the type of uncertainty perceived by professionals within the workplace learning context. This means that professionals employ distinct SRL strategies based on the type of uncertainty they perceive. Networking, help-seeking from colleagues emerged as the most significant strategies used by professionals irrespective of the type of uncertainty they perceived. Task interest and value, strategic planning, and self-reflection were dominant in effect and response uncertainty.

Findings from Study 1 and Study 2 established the importance of undertaking learning in uncertainty and revealed the most prominent learning strategies employed in different types of PEU. Study 3 examines how professionals SRL behaviour can be supported.

## 5.9 Linkages to other studies

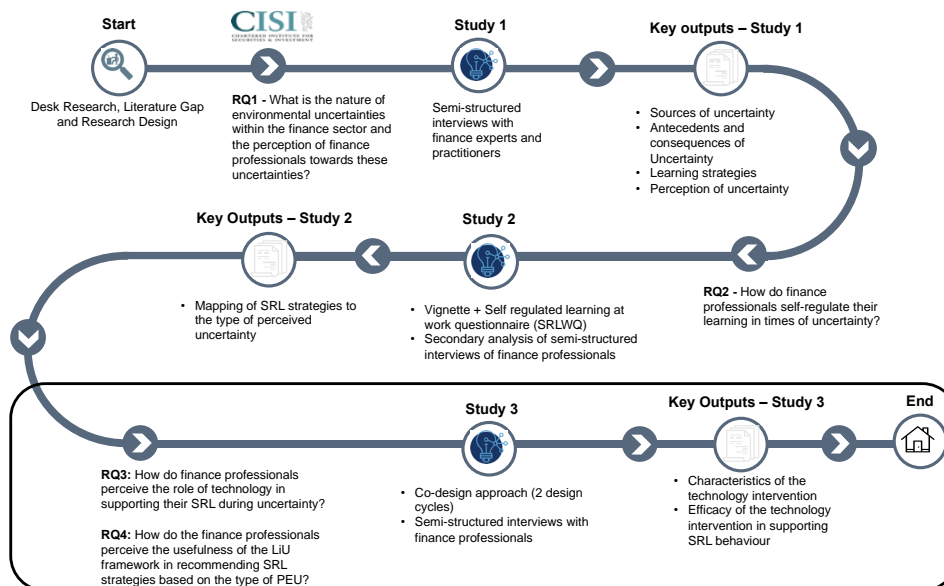


**Figure 5.18: Linkages to Study 1 and Study 3**

Rich descriptions of uncertainty situations from Study 1 interview data were distilled into uncertainty vignettes by Jacob and Mulder (2019) which were used in Study 2 for triggering an uncertainty perception in survey respondents. Study 2 found the specific strategies employed by professionals depending on the type of perceived uncertainty. Based on these findings, the LiU framework was proposed, which will be evaluated in **Study 3**.

## Chapter 6: Study 3 – Role of technology in supporting SRL in PEU

Study 1 explored the perceived nature of uncertainty by delineating the various sources, nature, scale, antecedents, consequences, and overall perception of uncertainty. It signalled the need to unpack the learning strategies employed in uncertainty. Study 2 examined the relationship between SRL and PEU, revealing specific SRL strategies corresponding to the type of perceived uncertainty. It also presented the ‘Learning in Uncertainty’ (LiU framework) conceptual framework, elaborating the SRL strategies employed by professionals based on the type of PEU based on the findings from Study 1 and Study 2. The objective of Study 3 is to 1) examine the perceived role of technology in fostering SRL behaviour of finance professionals during times of uncertainty and 2) evaluate the LiU framework. **Figure 6.1** captures the part of the research design covered in this chapter.



**Figure 6.1: Scope of Chapter 6**

This chapter describes the methods and presents the findings of Study 3, which explored the perceptions of finance professionals regarding the role of technology in scaffolding their SRL when dealing with uncertainty. This chapter consists of six sections. **Section 6.1** outlines the research questions answered in this chapter. **Section 6.2** describes the methodological and analytical approach used for addressing the research questions posed in this study. **Section 6.3** includes information about the low-fidelity wireframe developed in iteration one and the results from the evaluation of the wireframe. **Section 6.4** presents the design of a high-fidelity prototype built on the feedback received

for the wireframe. It also includes the results of the prototype evaluation. **Section 6.5** answers the RQ by comparing and contrasting the evaluation findings from iteration one and two. **Section 6.6** discusses the emergent themes and draws a comparison between the findings from Study 3 and extant literature. **Section 6.7** outlines the limitations of this study. The chapter culminates in **Section 6.8** with a brief conclusion.

## 6.1 Introduction

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The review of the literature highlighted the role of using technology to support SRL of professionals in the workplace context (**Section 2.8**). A gap was identified that warranted investigation of the perceived potential for technology to support financial professionals' SRL during times of uncertainty. Also, in the interest of closing the research loop it was necessary to evaluate the LiU framework. Co-design approach was a natural choice for exploring the potential of technology and to evaluate the practical application of the framework. Since these research objectives aligned with CISI's organisational objective to gain a deeper understanding of the role of technology in supporting their members' learning in uncertainty, they were active partners in the co-design process. Thus, Study 3 was planned with the following research questions in mind:

**RQ3:** How do finance professionals perceive the role of technology in supporting their self-regulated learning during uncertainty?

**RQ4:** How do the finance professionals perceive the usefulness of the LiU framework in recommending SRL strategies based on the type of PEU?

As seen in **Figure 5.18**, Study 1 and Study 2 formed the contextual inquiry phase that informed the design of the LiU framework (see **Figure 5.16** and **Figure 5.17**). The goal of Study 3 was two-fold: 1) to evaluate the LiU framework and present a proof of concept for the learning in uncertainty approach that was developed and implemented as a technology intervention, and 2) to examine the perceived role of technology in fostering SRL behaviour of finance professionals during times of uncertainty.

## 6.2 Methods

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### 6.2.1 Co-design Approach

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The aim of Study 3 was to examine the perceived role of technology in fostering SRL of finance professionals in uncertainty. The objective of the study warranted an empirical and iterative approach to evaluate a technological platform based on the LiU framework. Design-based research

approaches iteratively integrate academic research, industry practice and technology development (Dennerlein et al., 2020). Co-design is a design-based research approach that has roots in participatory methods and is a process that combines generative or exploratory research that identifies the problem, with an iterative design that creates the solution (Van den Akker, 1999). Co-design can be used to create and evaluate a product, service or system. It can be applied to anything from an app that supports learning activities to major learning and development reform processes. Sanders and Stappers (2008) outlined the following steps for a typical co-design method based on user-centred design theory:

- Step 1: Explore the context of use (of the product being co-designed)
- Step 2: Capture the user and organisational requirement through exploratory methods
- Step 3: Create design solutions
- Step 4: Evaluate the designs against the user requirement
- Step 5: Product development

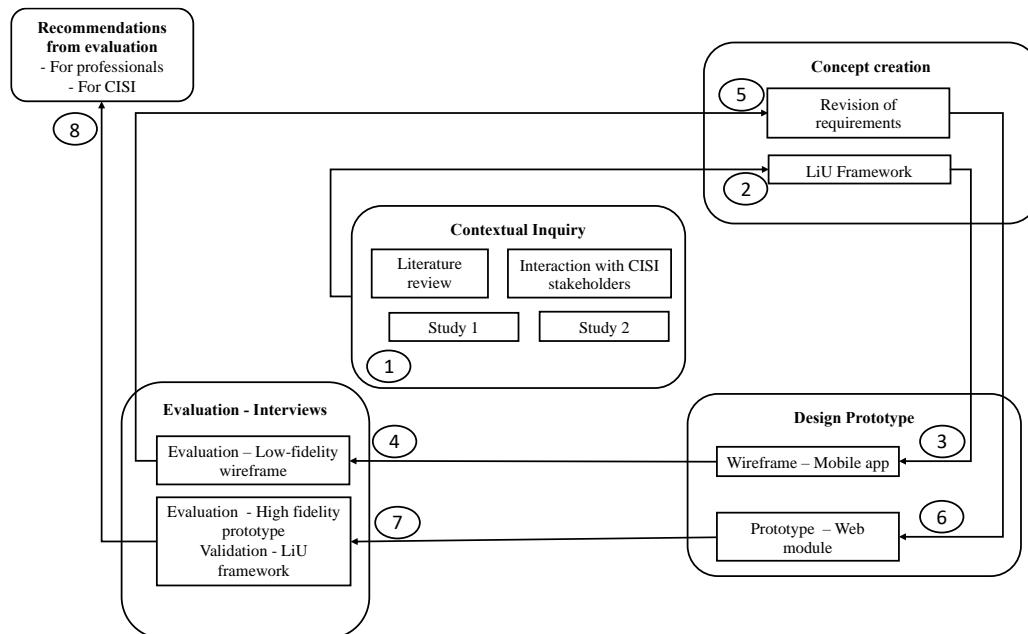
However, a full-fledged implementation of all the co-design processes from concept creation to product development was not in scope for this study. Hence a methodological approach that borrowed from co-design principles was deemed to be the most appropriate for this study. The methodology used in Study 3 was adapted from Sanders and Stappers (2008) co-design process as follows (**Table 6.1**):

**Table 6.1: Adaptation of Sanders & Stappers (2008) co-design process**

<b>Sanders and Stappers (2008) co-design process</b>	<b>Adaptation in Study 3</b>
Step 1: Explore the context of use	Literature review, talking to CISI stakeholders, workshop with professionals
Step 2: Capture the user and organisational requirement through exploratory methods	This was achieved through findings from Study 1 and Study 2
Step 3: Create design solutions	Designing mobile app wireframe and web module prototype
Step 4: Evaluate the designs against requirement	Conducting semi-structured interviews to get feedback on the wireframe and prototype
Step 5: Product development	Not in scope for Study 3
Collaboration between diverse research team and stakeholders	CISI gatekeeper acted as the primary collaborator throughout the design and evaluation phases. Other stakeholders were recruited during the iterative feedback phases.



**Figure 6.2** shows a visual representation of the iterative process of evaluation adopted in Study 3. The methodology applied to this study followed an iterative process of contextual inquiry, concept creation, prototype design and evaluation of technology platform.



**Figure 6.2: Visual representation of the methodological design of Study 3**

The first step in the co-design process was a contextual inquiry which consisted of conducting a literature review, interacting with the CISI stakeholders, and analysing data from Study 1 and Study 2. With this context in mind, in Step 2, the LiU framework was devised, which was then translated into a digital wireframe using Adobe XD. The wireframe developed in Iteration 1 was a low fidelity prototype in the form of mock-up screens without an integrated background logic. In step 4, the wireframe was evaluated by conducting semi-structured interviews with ten professionals. Analysing the interview data from the evaluation phase, a set of revision requirements were identified. Based on these revised requirements, a high-fidelity prototype was developed which was in the form of a web module. The second phase of evaluation was conducted to obtain feedback on the prototype. Since the prototype was a high-fidelity prototype which was developed to make personalised recommendations of strategies based on the type of perceived uncertainty, these interviews were also used to validate the LiU framework. The data from these interviews were condensed into a set of recommendations for professionals on how they could self-regulate their learning in times of uncertainty. It also consisted of a set of recommendations for CISI on how they could support their members to learn in uncertainty.

The first step in the co-design process was the contextual inquiry. Within the remit of this thesis, the context was 'understanding how professionals learn in uncertainty, and how can this learning be supported'. Findings from Study 1 and Study 2 gave useful starting points for conducting this inquiry. From both the studies, it was clear that learning in uncertainty was considered an

important topic of inquiry by finance professionals. This insight was aided by the in-depth literature review that identified the gaps in understanding learning in uncertainty process and the technologies available for supporting it. Another source of knowledge for the context exploration came from organising an impact workshop with finance professionals at the CISI, London office. As mentioned in Chapter 5 (**Section 5.2.1.1**), a lunchtime workshop entitled ‘Managing Uncertainty in Finance – Role of technology’ was conducted to advertise the LiU questionnaire for Study 2. The purpose of the workshop was twofold – one to advertise the LiU survey for Study 2; the second was to give something back to the CISI community for providing research access and their continued support for this research. An unexpected third benefit was realised from the workshop – having in-depth discussions with professionals about their expectations from technological support for learning in uncertainty. However, since this workshop was not designed for data collection, structured data could not be collected from the workshop. However, the knowledge built in this explorative phase gave a basis for designing the prototype. In the next concept creation phase, the LiU framework created based on findings from Study 1 and Study 2. The details about the iterative process of implementing the framework into a digital platform in the form of prototypes 1 and 2 and their evaluation are described in detail in **Sections 6.3** and **6.4**.

The next two subsections (**Section 6.2.2** and **6.2.3**) explain the settings and participants for the co-design iterations and the analytical methods used to analyse the interview data.

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### **6.2.2 Settings and Participants**

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The following selection criteria were used to recruit participants for Study 3:

- Professionals working at any financial institution
- A mix of professionals from various range of experiences

Studies show that usability evaluations provide maximum cost-benefit ratio when the number of users are between 5 to 10 (Nielsen & Landauer, 1993). Hence the recruitment target for the study was 10 participants per iteration. Similar to Study 1 and Study 2, the participants for Study 3 were also predominantly from CISI. Based on recommendations from the industry gatekeeper, initially, 25 finance professionals were contacted via email to understand if they would be willing to participate in this research. Some of the participants who had participated in Study 1 and 2 and who had shown willingness to participate in future studies of the research, were also contacted. Out of these 6 professionals responded positively. After conducting the initial 7 interviews, 3 more participants were recruited using the snowballing method of taking references from the existing research participants. Although they were not CISI members, all three of them worked at financial institutions. Finally, 10 interviews were conducted in the first iteration. Of the 10 participants, 7 were male, and 3 were female. The initial plan was to use the same 10 participants in both the iterations. However, 3 of them

were unable to commit time for the next phase (**Participant numbers – 1.3,1.6, 1.10**). Hence three new participants were recruited in the second iteration by asking for recommendations from the professionals taking part in Iteration 1. Finally, there were 6 male and 4 female participants in Iteration 2. **Table 6.2** gives an overview of Iteration 1 and 2 participants.

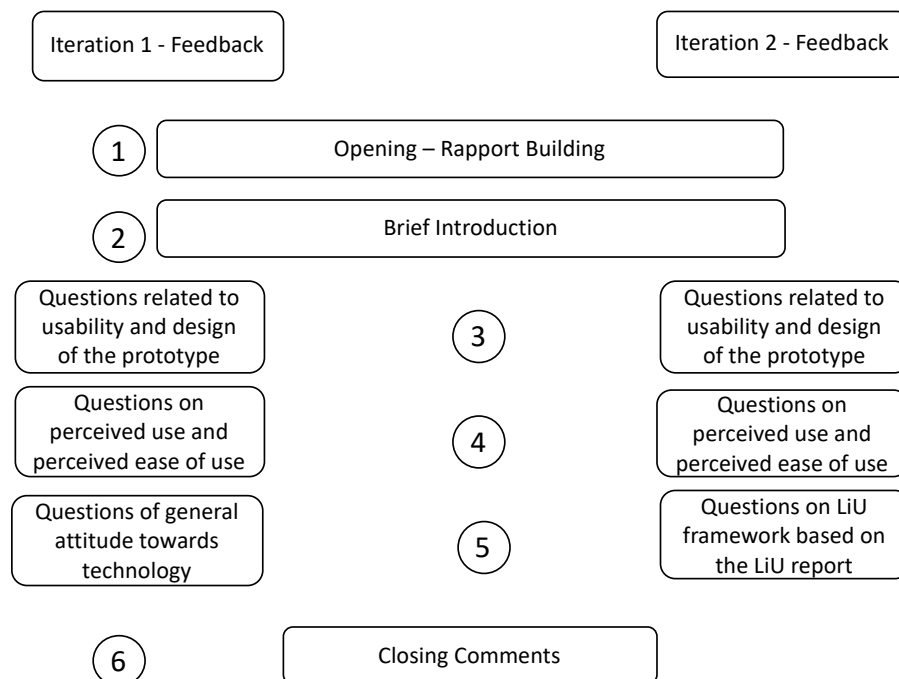
**Table 6.2: Participants in Study 3**

<b>Iteration 1</b>			
<b>ID</b>	<b>Role</b>	<b>Years of Experience</b>	<b>Gender</b>
<b>1.1</b>	Asset Manager	14	M
<b>1.2</b>	Professional Standards and Ethics Manager	7	F
<b>1.3</b>	Director, Capital Market	19	M
<b>1.4</b>	Senior Adviser	45	M
<b>1.5</b>	Finance Analyst	13	M
<b>1.6</b>	Learning Manager	5	M
<b>1.7</b>	Senior Financial Analyst	12	F
<b>1.8</b>	Financial Consultant	16	M
<b>1.9</b>	Tax Manager	14	F
<b>1.10</b>	Vice President	22	M
<b>Iteration 2</b>			
<b>2.1</b>	Assistant Vice President	18	M
<b>2.2</b>	Professional Standards and Ethics Manager	7	F
<b>2.3</b>	Tax Manager	14	F
<b>2.4</b>	Financial Consultant	16	M
<b>2.5</b>	Senior Adviser	45	M
<b>2.6</b>	Financial Accountant	11	M
<b>2.7</b>	Senior Financial Analyst	12	F
<b>2.8</b>	Finance Analyst	13	M
<b>2.9</b>	Asset Manager	14	M
<b>2.10</b>	Internal Auditor	8	F

The participants had an average experience of 16.25 years, with a maximum of 45 years, and minimum of 5 years. Thus, there was a fair representation of professionals from various experience levels.

### 6.2.3 Qualitative Instruments

As described in the previous section (**Section 6.2.2**), there were two iterations of the co-design cycle, during which the semi-structured interviews were conducted to evaluate the two prototypes. Two semi-structured interview schedules were created. The objective of the Iteration 1 interviews was to gather feedback about the wireframe in terms of usability features, platform preferences, and to examine professionals' general attitude towards technology. In the second iteration, the objective was to evaluate prototype 2 in comparison to the wireframe. Since prototype 2 had a business logic layer, in order words, it could compute personalised strategies based on the type of PEU identified from the responses, it was also used to validate the LiU framework. The similarities and difference between these two schedules are outlined below in **Figure 6.3**.



**Figure 6.3: Interview schedule for Iteration 1 and Iteration 2**

An initial interview outline was developed with six broad sections. The first two sections included rapport building and introductory questions about their experience within the financial sector and general questions about their respective domains. The agenda and purpose of the interviews were also made clear to the participants. The next three sections of the interview schedule comprised of questions related to:

- Usability and design of the prototype
- Questions related to perceived usefulness and perceived ease of use. The closing section consisted of an open-ended question that presented an opportunity to the participants for adding any additional information to the discussion.
- In the Iteration 1- the 5<sup>th</sup> section was about exploring general attitude towards technology, while in Iteration 2, it was about validating the LiU framework.

The interview schedule was piloted with 2 PhD students from the Open University, and once with the CISI gatekeeper. This helped to fine-tune and reduce the number of questions, such that the interview did not last over 30 - 40 minutes. Finally, 20 interviews were conducted - ten for each iteration. All the interviews were conducted via Skype.

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## 6.2.4 Procedure

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Study 3 had two objectives: 1) to examine the perceived role of technology in fostering SRL behaviour of finance professionals in times of uncertainty and 2) to validate the LiU framework. In order to examine the perceived role of technology in terms of ease of use, perceived usefulness, and platform preferences, two iterations of the design cycle were planned. The first iteration focused on requirement elicitation regarding usability features and preferred technology platform. The second iteration aimed to implement feedback from Iteration 1 in enhancing and customising the technology support and to validate the LiU framework. The procedure undertaken during each iteration is outlined in the subsequent sections:

### 6.2.4.1 Procedure for Iteration 1

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The procedure used for iteration 1 is elaborated below:

Before the interview:

**STEP 1:** Creation of the wireframe in Adobe XD and access through [appetize.io](https://appetize.io) (details about the prototype creation and user interface is given in **Section 6.3.1**).

**STEP 2:** The prototype link was sent to the participants one day in advance along with a reminder email to ensure that they had access to the link, and to resolve any access issues before the interview. This prevented any disruptions during the interviews.

On the day of the interview:

**STEP 3:** Explained the objective of the research.

**STEP 4:** After the rapport building questions (see **Appendix 12** for full interview schedule), the participants were asked to go through the user flow for recording an ‘uncertainty moment’ via the mock-up screens.

**STEP 5:** Then they were asked to intuitively follow the steps to find where the uncertainty moment is logged, and the strategies recommended.

**STEP 6:** During a short follow-up interview, the participants were asked questions about:

- Design and usability
- Perceived ease of use
- Perceived usefulness
- Behavioural intent
- General attitude towards technology
- General feedback about platform preference

#### 6.2.4.2 Procedure for Iteration 2

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The procedure used for iteration 2 is elaborated below:

Before the interview:

**STEP 1:** Creation of the web module (details about the prototype 2 creation and user interface is given in **Section 6.3.2**).

**STEP 2:** The prototype link was sent to the participants two weeks in advance. They were asked to think of a current uncertainty they were facing at their workplace, and then to perform the task of ‘logging an uncertainty moment’ from the home screen. Based on the responses, a personalised ‘Learning in uncertainty’ (LiU) report was created for each participant and shared with them 3 days before the interview (see **Appendix 13**)

On the day of the interview:

**STEP 3:** Explained the objective of the research and rapport building questions

**STEP 4:** They were asked questions about the LiU report to gather feedback about the strategies presented to them.

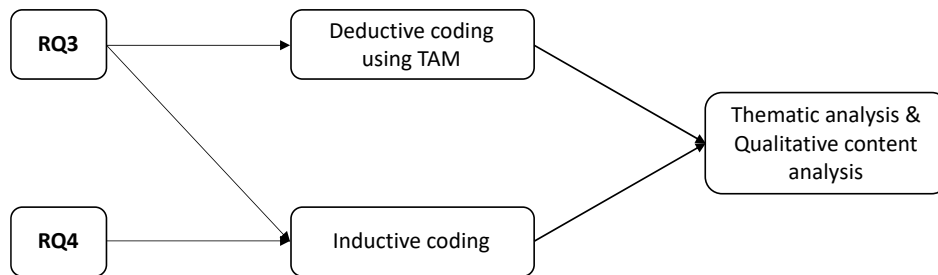
**STEP 5:** During a short follow-up interview, the participants were asked questions about:

- Design and usability
- Perceived ease of use
- Perceived usefulness
- Behavioural intent
- Feedback on LiU framework

All the twenty interviews from the two iteration cycles were recorded and transcribed using NVivo 12 software (Woolf & Silver, 2017) for further analysis. The following section elaborates the analytical methods employed to analyse the interview data.

### 6.2.5 Analytical Methods

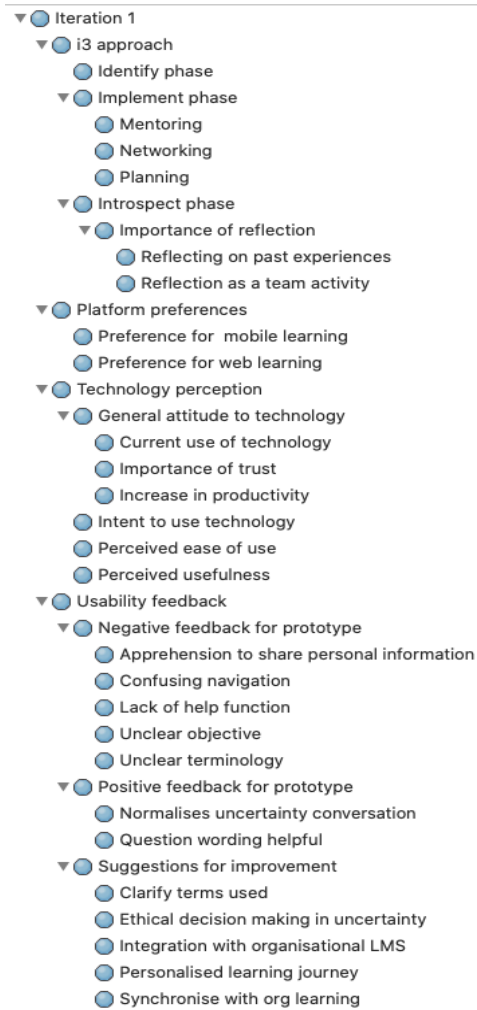
Similar to Study 1, both thematic analysis (TA) (Section 4.2.3.2) and qualitative content analysis (QCA) (Section 4.2.3.3) techniques were used to analyse the interview data. There were advantages to using both the analytical methods. The TA gave rich insights into participants perception of the prototype, while frequency counts in QCA were instrumental in comparing the feedback between the two prototypes. The process of TA was adapted from Braun and Clarke (2006) (see Figure 4.7, Chapter 4). Figure 6.4 shows the graphical representation of the analytical methods used in answering RQ3 and RQ4.



**Figure 6.4: Graphical representation of analytical methods used in Study 3**

As per Braun and Clark's (2006) phases of thematic analysis, all the interview transcripts were read multiple times and inductively coded. In the second step, deductive coding was done using the technology acceptance model (TAM) (Davis, 1989) ( see Section 2.9).

The primary objective of Iteration 1 was to obtain feedback regarding the usability of the prototype, capture platform preferences if any, and ask participants for any suggestions for improvement. It was also used to capture their perception about which phase of i<sup>3</sup> approach would any technology support be most useful. Following codes were identified from Iteration 1 interviews (Figure 6.5):



**Figure 6.5: Themes and codes for Iteration 1**

The interviews for Iteration 2 focused on capturing the perception of participants regarding the role of technology in supporting learning in uncertainty. They were also asked about the perception about the LiU framework, and perceived usefulness regarding the personalised strategies suggested by the prototype. The following themes and codes were identified from Iteration 2 interviews (**Figure 6.6**):





**Figure 6.6: Themes and codes for Iteration 2**

Having explained the methodological approach and analytical methods employed in Study 3, the following sections elaborate on the design and evaluation of the wireframe in Iteration 1 (Section 6.3) and prototype 2 in Iteration 2 (Section 6.4). These findings are synthesised in Section 6.5 to answer the research questions RQ3 and RQ4.

## 6.3 Iteration 1

### 6.3.1 The wireframe

As shown in Figure 6.2, the wireframe prototype was designed to implement the LiU framework on a technology platform. The objective of the wireframe was:

- To gather usability feedback for the technology prototype.
- To get a preliminary idea about how LiU framework can be implemented on a technology platform, and in which phase of the identify-introspect-implement can it be most effective in supporting learning activities.
- To capture platform preferences if any, and ask participants for any suggestions for improvement

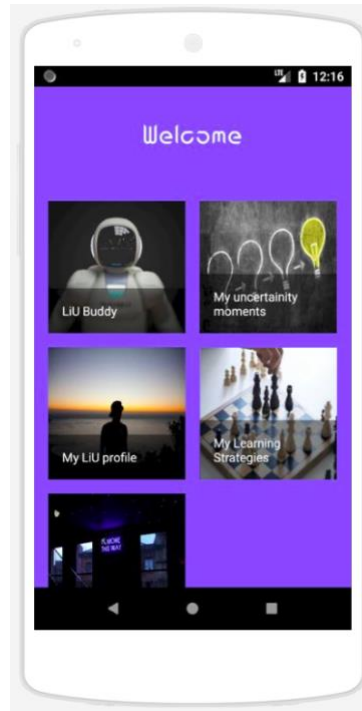
As such, a rudimentary, low-fidelity prototype in the form of a mock-up wireframe was created on Adobe XD and the API was uploaded to [appetize.io](https://appetize.io) for ease of access via a web-link. As it

was just a wireframe, there was no backend logic to the strategies recommended or identification of the type of PEU. The design considerations of the wireframe were based on the following requirements:

**Table 6.3: Mapping design requirements with the mock-screens in the wireframe**

Design Requirement	Screen
A home screen connecting all the linking tabs	Home screen with all the tabs (Figure 6.7)
A screen to present the LiU survey questions to the user	LiU Buddy – clicking on this will take the user to answering all the survey questions ( <b>Figure 6.8</b> )
A screen for showing the results obtained from analysing user data	My LiU profile – summary of the survey results (Figure 6.10)
A screen for showing the personalised strategies	My LiU strategies – list of recommended strategies (Figure 6.10)
A screen where historical data is displayed	My uncertainty moments – Time stamped uncertainty moments logged ( <b>Figure 6.9</b> )
A screen to give some background about the research	More about i <sup>3</sup> - A brief overview of the research (Figure 6.11)

**Figure 6.7** shows the home screen, which was the first screen that a user lands on after clicking on the link.



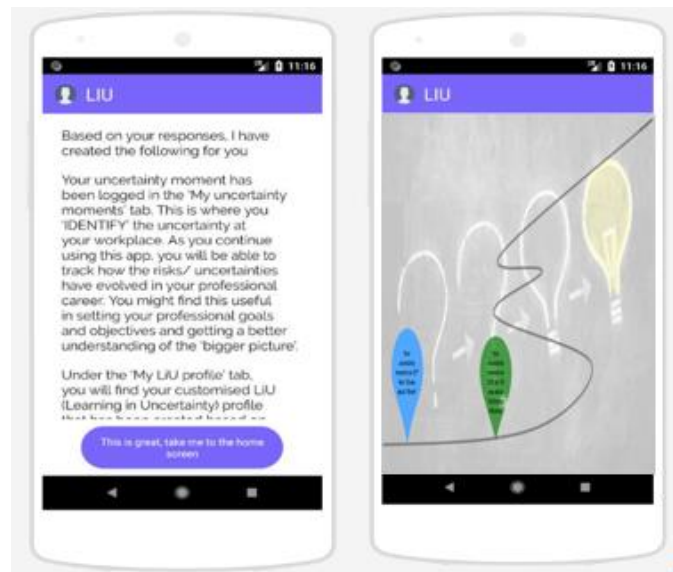
**Figure 6.7: Home screen of the wireframe**

The first tab was 'LiU Buddy' (**Figure 6.8**). This is where the participants were asked to answer a set of questions to identify the source of uncertainty, introspect on the available strategies and skills, and lastly to implement the learning strategies. These questions were taken from the LiU survey instrument used in Study 2 (**Appendix 9**).



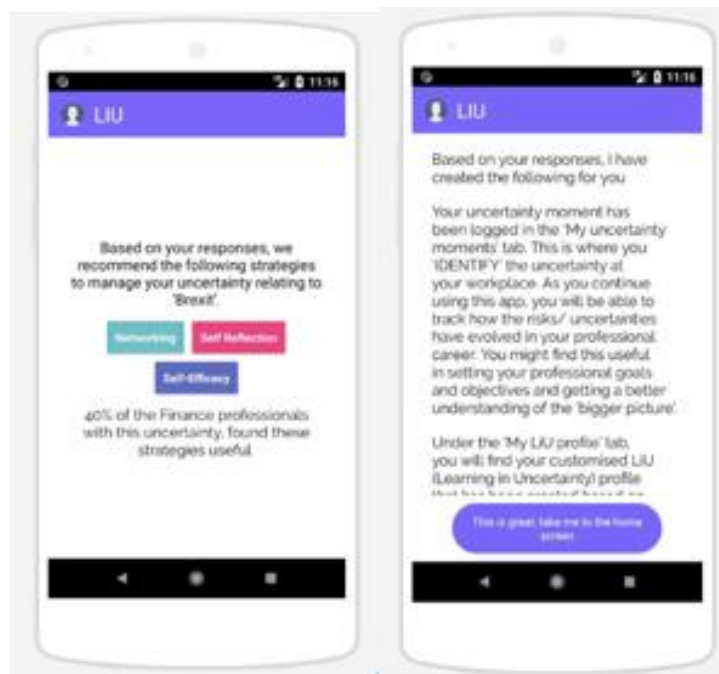
**Figure 6.8: LiU Buddy**

'My uncertainty moment' was a mock-up screen that depicted how the uncertainty details will be displayed back to them and how uncertainty moments will be logged over a period of time. (Figure 6.9).



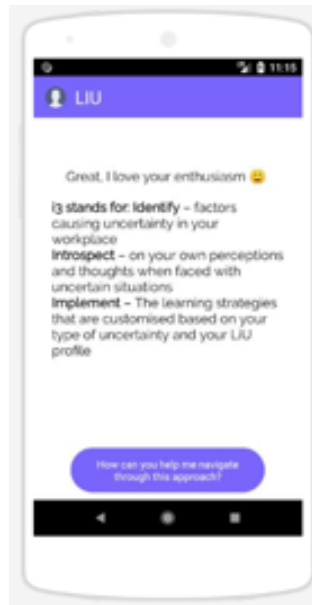
**Figure 6.9: My uncertainty moments**

Based on the responses to the SRL questions and type of PEU, learning strategies were suggested (Figure 6.10). In the absence of a background logic, these strategies were not dynamic, and the same set of strategies from Zimmerman's framework were used.



**Figure 6.10: My LiU Profile and learning strategies**

The tab – my LiU profile was used for logging all the strategies suggested to the participant, along with their scores of SRL. Finally, the i3 approach to LiU tab gave a brief overview of the research and its findings (**Figure 6.11**).



**Figure 6.11: More about the i<sup>3</sup> approach to LiU**

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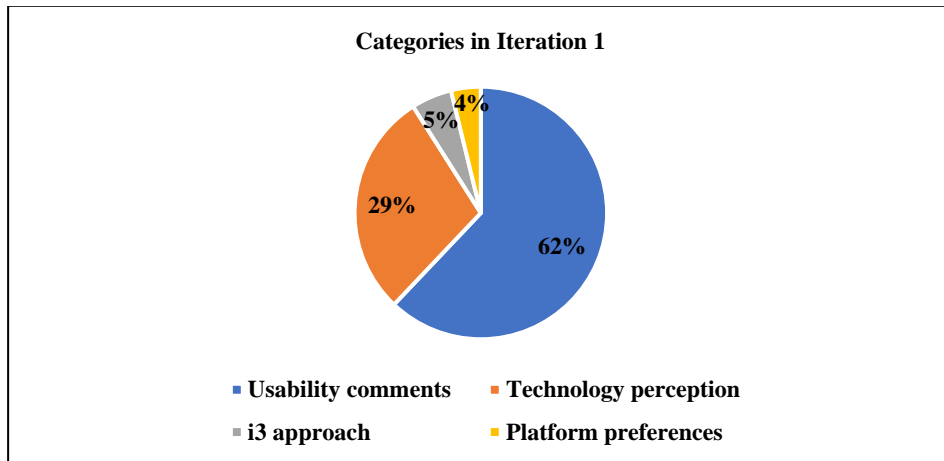
## 6.3.2 Evaluation of the wireframe

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### 6.3.2.1 Qualitative content analysis

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As discussed in **Section 6.2.6**, the ten interview transcripts were openly coded first to identify the broad themes in the data. In the second phase of analysis, the TAM framework was used to code the interview transcripts deductively. A total of 388 statements were coded. **Figure 6.12** depicts the broad categories identified in the analysis. Since the focus of these interviews was mainly to obtain feedback about the prototype, 62% of the codes were related to usability comments, which were coded at all the participants, 29% were related to their general perceptions and attitude about technology, 5% were about the i<sup>3</sup> approach, and 4% were platform preferences.



**Figure 6.12: Categories from interviews of Iteration 1**

**Table 6.4** gives a descriptive summary of themes and categories. Within usability comments, statements coded as positive feedback (38.3%) were slightly lower than negative feedback (42%). The highest number of codes were for general attitude towards technology (32%), with a close second intent to use technology (28%). When asked which part of the i<sup>3</sup> approach would any technology support be most effective, an overwhelming majority indicated a preference for technology support in introspect phase (81%). In terms of platform preference, all the participants indicated that they are happy with online learning, but only 6 people mentioned mobile learning.

**Table 6.4: Categories and themes for Iteration 1**

Code	Number of statements coded	% of total statements	Number of participants coded
<b>Usability comments</b>	241		10
Positive feedback for prototype	92	38.20%	10
Negative feedback for prototype	101	42.00%	10
Suggestions for improvement	48	19.80%	10
<b>Technology perception</b>	112		10
Perceived ease of use	19	17.00%	10
Perceived usefulness	26	23.00%	10
General attitude towards technology	36	32.00%	10
Intent to use technology	31	28.00%	9
<b>i<sup>3</sup> approach</b>	20		10
Identify phase	1	5.00%	1
Introspect phase	16	81.00%	10

<b>Implement phase</b>	3	14.00%	2
<b>Platform preferences</b>	15		10
<b>Preference for mobile learning</b>	6	38.00%	6
<b>Preference for web learning</b>	9	62.00%	10

The following section presents the results from thematic analysis of the interview transcripts.

### 6.3.2.2 Thematic analysis

The previous section presented the results from qualitative content analysis. In this section, the numbers from QCA are unpacked to explore deeper insights into the perception of participants and to identify revision criteria for the second iteration.

#### 6.3.2.2.1 Usability Comments

This category contained statements that related to the usability related feedback for the wireframe. There were three main themes coded under this category:

##### Positive feedback for the prototype

38% of total statements coded under usability were related to positive feedback for the prototype. One of the most common positive feedback was regarding the questions that were asked. Participants said that questions in itself were very reflective and helped verbalise the challenges that they faced in their work life.

I thought that the questions are engaging throughout and I liked that it asked you not to labour over your answers too long, particularly in something like this when you are trying to put together a profile and there's not really a correct answer and that is all down to you.

**(Participant 1.5)** (see

**Table 6.2** for participant details).

Participants mentioned that a technology similar to the one proposed in the wireframe would equip the professionals with the vocabulary or a starting point for having difficult conversations around uncertainty, which are typically avoided. For example, **Participant 1.2** elaborated how important it was to have honest conversations about dealing with uncertainty, and how this app can be used as a starting point within organisations or teams:

I think especially within the realm that I'm working in – ethics, the difficulty that we find is that people don't want to talk about the difficult things cause it's not the norm. So as soon as

you can get people to kind of think about the steps which they need to take if they're dealing with levels of uncertainty then you're creating the conversation and you're making the level of trust within the sector that much more important, and you are increasing the level of trust.

**(Participant 1.2)**

They highlighted the impact that a digital tool like the one being proposed in the wireframe, could have on public trust in the finance sector. They said that public trust in the finance domain was on the verge of decline but was now regaining due to steps taken by the sector for building a 'better community' and 'better culture of trust' and that anything that can help professionals have honest communication would be for the betterment of the sector.

There is something called an Edelman survey which basically looks at the level of public trust between different sectors - so you know how much do the public trust bankers, how much do the public trust doctors, and nurses, and the financial realm does not do very well... but that is changing. There is an increasing level of trust within the financial realm because there's a better community, a better culture of trust, and that is because of communication apps like yours that will help people talk about these difficult things. **(Participant 1.2)**

The general sentiment was that although uncertainty is accepted as an inherent part of their work-life, there was a lack of open communication regarding the perception of uncertainty and how it impacts professionals. Getting people to talk about uncertainty was seen as big positive for such a technology implementation.

Maybe not between you know enormous groups of people but as soon as you could engage that conversation, people go – 'hold on a minute I don't really know what I should be doing here, let me try and let me speak with somebody ...let me gain a second opinion that will be the start of encouraging professionals to talk about uncertainty, to think how it is better received ... **so that will be the first step and I guess that is one of the main other benefits that you should highlight because this is something that is important.** **(Participant 1.4)**

## **Negative feedback for the prototype**

42% of the total statements coded were negative feedback about the prototype. Most of the statements coded under this theme related to the user interface and the look and feel of the prototype and were answered in response to the question – was there something you did not like? In most



instances, the first response was regarding the user interface, but all the participants made it clear that they understood that it is because it was only in the prototype phase. These are a few examples:

I thought and again it's probably just because of the stage at which the product is at that some of the wording maybe a little bit confusing or maybe just a little obtuse. **(Participant 1.7)**

I mean obviously as you said, it is just a prototype, so it is probably not very useful to say that it looks a bit plain or whatever because obviously you know that. **(Participant 1.1)**

Also, the font size was a bit tiny and weird, but then again, it's just a prototype app. **(Participant 1.2)**

The most useful negative feedback, which could be taken on as an action item for revising the design of the second iteration prototype was regarding the content and the sequencing of user flow. Feedback shared by 6 out of 10 participants was about confusion in navigation. Feedback regarding navigation revealed a prominent design error – which was the inability to go 'back' while responding to the questions.

So, when I tried to go back it just reset the whole thing and took me back to LiU Buddy... was it supposed to do that.... And when I tried going through it had not stored any of my responses, which can be a bit annoying to be honest, sorry (laughs), because when you answer so many questions you want your app to just remember it. **(Participant 1.3)**

At the home screen, I was a bit unsure about where to begin as there was no clear signposting, and I did not realise what each of those little boxes (referring to the tabs) meant. **(Participant 1.9)**

Closely related to the confusing in navigation was lack of clarity regarding the objective of the prototype. Participants mentioned that were unclear about 'what the app was trying to achieve' **(Participant 1.7)** and that it would be better to have an explanation upfront about the 'research' and 'objective'.

There was also some confusion about some of the academic terms used in the questions. For example, **Participant 1.10** mentioned that they were unclear about the questions regarding 'self-reflection':

I apologise for my ignorance here, and I might be completely wrong in my understanding, but when the app suggested self-regulation as a strategy, I have to admit that I am not sure what it means, and how do I go about practising it. I mean after being in the industry for as long as I have been, you develop a certain sense of intuition you could call it. But I don't think I practice any deliberate reflection as to where those intuitions stem from. **(Participant 1.10)**

### **Suggestions for improvement**

19.8% of the total statements coded were regarding suggestions for improvement in the next iteration. The most common suggestion was to develop a technological tool that could be easily integrated into the organisational LMS.

It is unlikely that I will find time to use an app for my professional development, more so because our organisation takes care of all the training documentation, and if I have to discuss any training needs with my manager, it would be better if it is generated within the organisational system. **(Participant 1.4)**

**Participant 1.2** identified three challenges with the implementation on a mobile platform:

I think the restriction is when you put it into an app because then yes, it's fantastic, it's technologically advanced, but then it's not easy to implement – a) you have to ensure that people download that and b) open it and c) utilise it which is another issue. But if you can get something like a web version of what you have - really interactive and it will not only be a sign posting will also be something that is signed up through organisations, it could definitely be resolved so you can continue to update as well. **(Participant 1.2)**

When asked if there were any other reasons why they would prefer a web version, they stated their preference for a source which is regularly updated rather than a static version:

I think you know with resources like these the merit is in how much content is updated. There's no point in having information on it if it's five years ago or even if it is 5 months ago, but yeah so be it will be easier as well if you're able to update online, I mean on the web version. Then just go from there. **(Participant 1.2)**

Another 'nice-to-have' feature that was indicated by the participants was creation of personalised user journeys or personalised reports.

... it would be cool if our <org.name> system could generate personalised reports. We train plenty of professionals from various domains, and they all have different requirements. An understanding of their needs would be pretty cool. **(Participant 1.6)**

Related to the generation of personalised reports was the suggestion for dynamic strategies which could get updated regularly.

When you say finance domain it is in a very broad sense indeed and new challenges and uncertainties emerge every day. At the moment we are seeing a surge in interest surrounding sustainable investments or green finance. But if you have a system that does not pick up on these changes in the market then the strategies suggested will be obsolete far quickly. **(Participant 1.4)**

#### **6.3.2.2.2 Technology perception**

The themes for technology perception category were deductively coded from the TAM model (**section 2.9**), and they accounted for 28.87% of the total statements coded. This was to capture perceptions of the participants regarding the ease of use, usefulness, and whether they intended to use it. Most of the participants responded positively when asked if they found the prototype useful, and if so, where did they see it be useful.

Where we are right now we are always going to use some sort of digital platforms to help us through various parts of life - so like mindfulness apps, healthcare apps, how many steps you are doing, whether it is your work or personal, you're going to be looking to your phone for it to do something. So, I think that you've got the right idea there in order to looking at what one can do to basically reflect on the issues of uncertainty. **(Participant 1.3)**

We do these networking events and so when we are offering people these networking events this kind of profiling may be useful. I think our organisation doesn't know their customer base well enough. I mean in my experience even basic market research is quite rudimentary and not informative, so we do need something like this (referring to the wireframe) to be able to actually give people what they want. **(Participant 1.8)**

Generally, most participants had a positive attitude towards use of technology, as they reported using a variety of technology at their workplace.

Well yes, it's saving time as all the information is been made available so quickly and so easily. Today I can get trained on the topics I want, with a person sitting in a foreign country with just few click of buttons, I actually feel I am sitting with him and taking training thanks to the video conferencing calls. Also, it is so easy to collaborate with so many different experts from all over the world in almost no time. This all have definitely raised the productivity standards. (**Participant 1.1**)

Totally! Without the means of a structured learning we would have been all over the place. Any organization which doesn't have a proper learning structure in place cannot work effectively. A great example is the tool we have, has mandatory trainings which all the employees need to complete, it also goes to an extent of impacting your yearly ratings , which I feel is amazing, given that all the employees have the same understanding of their organization and can be on the same page and if you see technology has had a big role to play in this streamlining process. (**Participant 1.6**)

Participants gave some example scenarios about how they would use the technology tool if the prototype was developed properly.

It will certainly help support our day to day learning. In the long run, we need some additional aid for expanding our learning and that cannot be achieved without the help of technology. (**Participant 1.3**)

**Participant 1.6**, a learning manager responsible for professional development and formal training of finance professionals, gave a unique insight into professionals' technology perception, based on their own experience. They explained that 'individuals are not interested in putting together their learning experience.' When asked, what did they think professionals expected from a technology tool for learning, their response was:

I think what they want is to have something tailored for them. They want somebody else to worry about that, it maybe because how busy they are all the time and stuff, but they really want to say - I don't do this, I don't have time to do all that you know. Everything you do has to last two minutes and we have to make everything fit into gaps.... I think they really want someone else to give them exactly the right thing rather than worrying about it by themselves and this could be a guaranteed solution (referring to the prototype. (**Participant 1.6**)

When asked about current technology usage, the professionals cited several examples of how they have been using technology in their learning. However, most of these were organisation related products rather than something that they used on an individual basis.

We have been using an internal learning tool called the 'My Learning' this has both the soft skills as well as the technical trainings needed and has a test at the end of every training which accesses your knowledge. **(Participant 1.5)**

My team uses an Organizational family tree webapp for our learning needs. This is a tableau-based version which is easy to Navigate and search for trainings you are looking for. **(Participant 1.7)**

We are using confluence (something like share point) to track not only our project related status, but also our training needs. **(Participant 1.1)**

#### **6.3.2.2.3 i<sup>3</sup> Approach**

All the participants thought that any kind of technology support would be most useful as a reflective or introspective tool rather than for planning learning activities.

I think that it is very interesting because it is very individual specific. So, I don't know how difficult or easier would be in order to (trails off) .... Like even within the financial realm there are lots of different individuals with lots of different issues so how is it in case that you're able to group some... **(Participant 1.2)**

I am thinking it is a bit too much to expect the app to identify the issue, because there are so many unknowns coming into it. I think introspection is the key thing here. Implementation is probably very item specific, like how you go about addressing something. But the process of introspection based on those questions, I think is well covered by the app indeed **(Participant 1.4)**

#### **6.3.2.2.4 Platform preferences**

The answers for platform preferences were related to the participants preference for organisation-led learning journeys, rather than planning for themselves. Professionals were reluctant to use a standalone app for supporting their learning. However, it was almost unanimously agreed that they would find it useful to use if it was embedded with CISI website or their organisational LMS.

It depends I guess where it is that you wanted it to sit – do you want it to be something online that people can complete online, because if it is online then you can go and pilot it out into different organisations. **(Participant 1.8)**

But it can also be a resource such that bodies can include it within their syllabus because it's an educational resource as well. It's looking at their reflection and I know within our ethical code of conduct we have this new clause ensuring that you are able to make the correct decisions, and this app is one of the approaches to doing this. One of those steps in which you would do to look at your risk, look at the level of uncertainty so you could even push it so much so that it becomes a resource that people look to when learning in uncertainty. **(Participant 1.7)**

## 6.4 Iteration 2

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As discussed in **Section 6.3**, evaluation of the Iteration 1 interviews provided a number of revision criteria in terms of usability, platform preference, to be implemented in prototype 2. **Table 6.5** summarises the key feedback received from participants in Iteration 1 interviews, along with the plan of action to address them in prototype 2.

**Table 6.5: Revision criteria for Iteration 2**

<b>Feedback from Iteration 1</b>	<b>Implementation plan in Iteration 2</b>
<b>User Interface – cosmetic issues</b>	The objective of Study 3 was not to develop a fully functional market ready technology tool. It was merely to evaluate the perception of technology support and validate the LiU framework. The main focus was to get the functional flow correct. Hence the cosmetic issues were not given much preference in the second iteration.
<b>Confusion in navigation</b>	A 'back' button to be added to the questionnaire, such that the participants would be able to modify their answers by going back.
<b>Unclear objective and confusion about terminology</b>	Both these criteria to be addressed by providing a background of the research

	objective and explanation of the terminologies used in the personalised report.
<b>Integration with organisational LMS</b>	This is the next level implementation which has dependency on obtaining intra-organisational technology access for testing the integration. This did not align with the objective of Study 3.
<b>Personalised learning journeys/personalised reports</b>	Personalised learning journeys required advanced AI/ML techniques and large amounts of comparison data for implementation. Hence within the context of this study, personalised LiU reports to be created for participants based on their responses.
<b>Dynamic strategies that could be updated in real-time</b>	Similar to personalised learning journeys, dynamic strategies would require advanced AI/ML techniques and large amount of ‘training’ data.
<b>Platform preference – Web</b>	The LiU framework to be implemented as a web-module. This implementation would have the ability to be embedded into external websites (e.g. CISI online CPD framework or organisation LMS)
<b>i<sup>3</sup> approach - Focus on introspection</b>	The user flow to be modified to retain only introspection related questions.

The next section explains the approach taken to design the second prototype based on the feedback outlined in **Table 6.5**.

#### 6.4.1 Prototype 2 – Design

The feedback from Iteration 1 revealed that a web module was the most preferred platform choice, as the professionals did not like the idea of using a standalone app that does not align with their organisational goals and objectives. Hence, it was decided to implement the LiU framework on a website instead of a mobile app. Since the LiU framework had to be validated in Iteration 2, a high-

fidelity prototype, with some background logic was needed. A three-tiered architecture<sup>9</sup> was employed, consisting of 1) Application layer; 2) Business logic layer; and 3) Database layer. The business logic layer was introduced to implement the logic for recommending strategies aligned to the perception of uncertainty, based on the participant responses. **Table 6.6** presents the questions asked as part of the LiU test in Iteration 2. These were the questions from LiU survey – consisting of SRLWQ scale and Milliken’s uncertainty scale.

**Table 6.6: Questions used in the Iteration 2 prototype**

Question ID	Question
	In this situation I am unsure about....
TU1	...what my workplace’s environment will be like in 1 year from now
TU2	...how probable the occurrence of that uncertainty is
TU3	...what impact this uncertainty will have on my workplace
TU4	...if my organisation’s reaction on that uncertainty will have a positive effect on my workplace
TU5	...what different response options I have to manage this uncertainty
TU6	...if my response to this uncertainty will produce desirable outcomes
	Please indicate the extent to which the following statements apply to you. Please do not think too long before answering; usually your first inclination is also the best one
SRLF1	...set personal standards for performance in my job.
SRLF2	...set long-term goals (monthly or yearly) in order to direct my learning activities
SRLF3	...set realistic deadlines for learning when I have identified a learning need.
SRLF4	...set goals to help me manage the time I spend learning.
SRLF5	...ask myself questions about each learning task before I begin.
SRLF6	...think of several ways to solve a problem and choose the best one..
SRLF7	..use specific strategies for different types of things I need to learn.

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<sup>9</sup> Technologies Used:

Application Layer – intuitive UI was designed using HTML 5 and Angular 8

Business Logic Layer – Microsoft Excel

Database Layer – MongoDB, which is an open source NoSQL database



SRLF8	...adapt strategies that have worked in the past, when planning my learning.
SRLF9	...can use what I learn in this job in the future.
SRLF10	...prioritize learning new things on the job
SRLF11	...can remain calm because I can rely on my abilities.
SRLF12	...can usually find several solutions, when confronted with this situation in my job.
SRLF13	...can usually handle whatever comes my way.
SRLF14	.... feel prepared for my occupational future because of my past experiences in my
SRLF15	.... meet the goals that I set for myself.
SRLF16	.... feel prepared for most of the demands.
SRLF17	.... think that learning that I undertake in this situation is important to me.
	Please indicate the extent to which the following statements apply to you. Please do not think too long before answering; usually your first inclination is also the best one
SRLP1	.... write down a plan to describe how I hope to achieve my learning goals.
SRLP2	.... ask myself how what I'm learning is related to what I already know.
SRLP3	.... change strategies when I don't make progress while learning.
SRLP4	.... make notes (including diagrams, etc.) to help organise my thoughts.
SRLP5	.... focus on the meaning and significance of new information.
SRLP6	.... organise my time to best accomplish my goals
SRLP7	.... try to relate new knowledge I find to what I already know.
SRLP8	.... bring together information from different sources (for example people and resources).
SRLP9	.... treat the resources I find as a starting point and try to develop my own ideas from them.
SRLP10	.... play around with ideas of my own related to what I am learning.
SRLP11	.... think about possible alternative ways to do my tasks.
SRLP12	.... ask my colleagues for help, when I am unable to understand something.
SRLP13	.... identify colleagues in my workplace whom I can ask for help if I need it.
SRLP14	.... look up something, if I am unsure of it.

SRLP15	.... fill in the gaps in my knowledge by getting hold of the appropriate material.
SRLP16	...try to understand the problem as thoroughly as possible
SRLP17	.... like opportunities to engage in tasks
SRLP18	.... prefer tasks that arouse my curiosity, even if I need to learn to achieve them
SRLP19	.... apply ideas from my previous experience.
	Please indicate the extent to which the following statements apply to you. Please do not think too long before answering; usually your first inclination is also the best one
SRLSR1	.... know how well I have learned once I have finished a task.
SRLSR2	.... ask myself if there were other ways to do things after I finish a task.
SRLSR3	.... think about what I've learned after I finish.
SRLSR4	.... think about how what I've learned fits in to the 'bigger picture' at my organisation.
SRLSR5	.... try to understand how new information I have learned impacts my work.
SRLSR6	.... consider how what I've learned relates to my team.

**Table 6.7** shows the logic implemented in the business layer to enable mapping of SRL strategies to the type of perceived uncertainty. For example, TU1 and TU2 items relate to state uncertainty as per Ashill and Jobber's (2010) validated survey instrument for measuring Milliken's (1989) PEU. The question items are worded as 'I am unsure about what my workplace's environment will be like in 1 year from now' and '...how probable the occurrence of that uncertainty is'. As all the variables were measured on a 5-point scale, with 1 being 'never true' and 5 being 'completely true', the maximum that one could score on those variables together is 10, and the minimum possible score is 2. A combined score of 6 or above for TU1 and TU2 would indicate that the respondent perceived state uncertainty. Initially, the sub-categorisation between moderate and high was not done. However, some respondents perceived multiple uncertainties together. Hence in order to determine the more predominant one, this categorisation was introduced. Similarly, the competency scores for SRL sub-processes was calculated by aggregating the individual item scores for that sub-process as per Zimmerman's (2000) SRL model. Since these question items came from validated questionnaires, the content validity and face validity of the responses is ensured.

**Table 6.7: Business logic to map strategies to PEU**

Logic ID	Logic	Score	Result
1	TU1 + TU2	6 - 8	Moderate State Uncertainty
2	TU1 + TU2	8 - 10	High State Uncertainty
3	TU3 + TU4	6 - 8	Moderate Effect Uncertainty
4	TU3 + TU4	8 - 10	High Effect Uncertainty
5	TU5 + TU6	6 - 8	Moderate Response Uncertainty
6	TU5 + TU6	8 - 10	High Response Uncertainty
7	SRLF2 + SRLF3 + SRLF4 + SRLF5 + SRLF6 + SRLF7 + SRLF8	21 - 35	Strategic Planning
8	SRLF11 + SRLF12 + SRLF13 + SRLF14	12 - 20	Self-Efficacy
9	SRLF1 + SRLF15 + SRLF16	9 - 15	Goal Setting
10	SRLF9 + SRLF10 + SRLF17	9 - 15	Task Interest/Value
11	SRLP7 + SRLP8 + SRLP14 + SRLP15 + SRLP16 + SRLP19	18 - 30	Elaboration Strategies
12	SRLP1 + SRLP6 + SRLP3 + SRLP4 + SRLP5	18 - 30	Task Strategies
13	SRLP10 + SRLP9 + SRLP11	9 - 15	Critical Thinking
14	SRLP12 + SRLP13	6 - 10	Help Seeking
15	SRLSR1 + SRLSR2 + SRLSR3	9 - 15	Self-Evaluation
16	SRLSR4 + SRLSR5 + SRLSR6	9 - 15	Self-Satisfaction

The logic explained in **Table 6.7**, was used to generate the LiU report, which consisted of:

- Background information about the LiU research
- SRL profile
- Type of PEU
- Recommended strategies based on SRL and PEU (based on findings of Study 2)

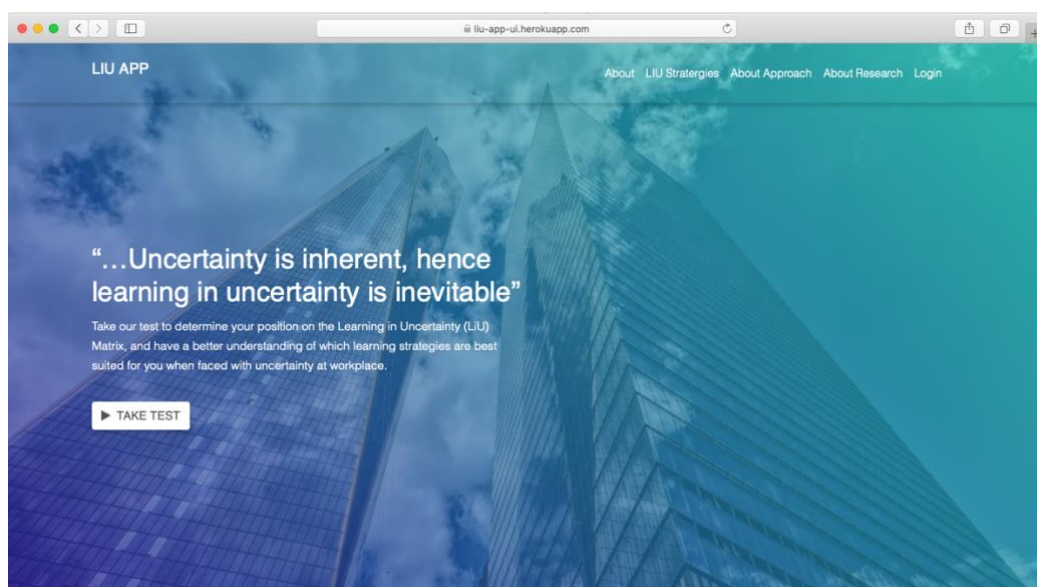
The SRL profile and type of PEU was created based on the competency scores calculated as per the logic explained in **Table 6.7**. Having explained the underlying three-tiered architecture design for the website, the following section explains the implementation details of the prototype.

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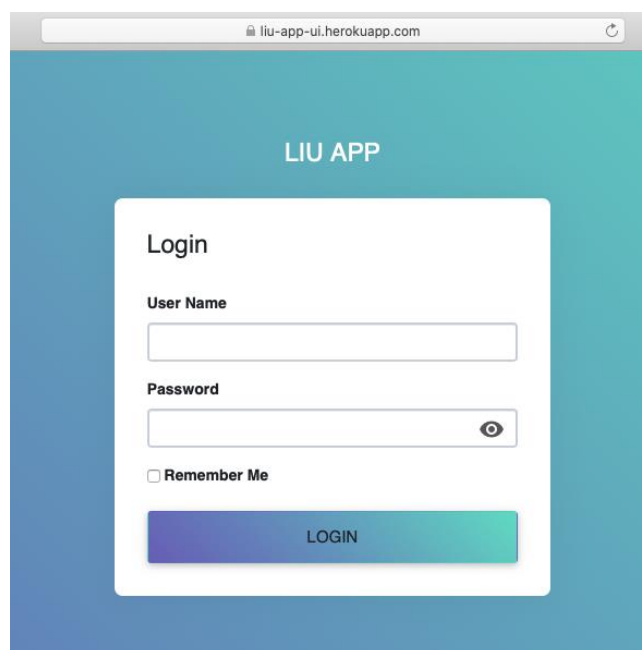
## 6.4.2 Prototype 2 – Implementation

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**Figure 6.13** shows the landing page of the web module mock-up prototype, which covers details about the research and link to register and login (optional). Login requirement (**Figure 6.14**) was kept optional, and participants were able to take the test, (**Figure 6.15**, **Figure 6.16**, **Figure 6.17**) even without registering. Session details were captured, only if the participants chose to register and login. Hence the personalised report generation was available only for registered users. The questions were the same as the ones used in the LiU survey used in Study 2 (**Appendix 9**). After completion of the test, additional functionalities such as personalised LiU strategies were made available.



**Figure 6.13: Prototype 2 – Landing page**



**Figure 6.14: Prototype 2 – login screen**

1 2 3 4 5

**In this situation I am unsure about**

What my workplace's environment will be like in 1 year from now

Never True ☐ ☐ ☐ ☐ ☐ Completely True

How probable the occurrence of that uncertainty is

Never True ☐ ☐ ☐ ☐ ☐ Completely True

What impact this uncertainty will have on my workplace

Never True ☐ ☐ ☐ ☐ ☐ Completely True

If my organisation's reaction on that uncertainty will have a positive effect on my workplace

Never True ☐ ☐ ☐ ☐ ☐ Completely True

What different response options I have to manage this uncertainty

Never True ☐ ☐ ☐ ☐ ☐ Completely True

If my response to this uncertainty will produce desirable outcomes

Never True ☐ ☐ ☐ ☐ ☐ Completely True

BACK NEXT

**Figure 6.15: Prototype 2 –type of PEU questions**

1 2 3 4 5

**Please indicate the extent to which the following statements apply to you. Please do not think too long before answering; usually your first inclination is also the best one**

know how well I have learned once I have finished a task

Never True ☐ ☐ ☐ ☐ ☐ Completely True

ask myself if there were other ways to do things after I finish a task

Never True ☐ ☐ ☐ ☐ ☐ Completely True

think about what I've learned after I finish

Never True ☐ ☐ ☐ ☐ ☐ Completely True

think about how what I've learned fits in to the 'bigger picture' at my organisation

Never True ☐ ☐ ☐ ☐ ☐ Completely True

try to understand how new information I've learned impacts my work

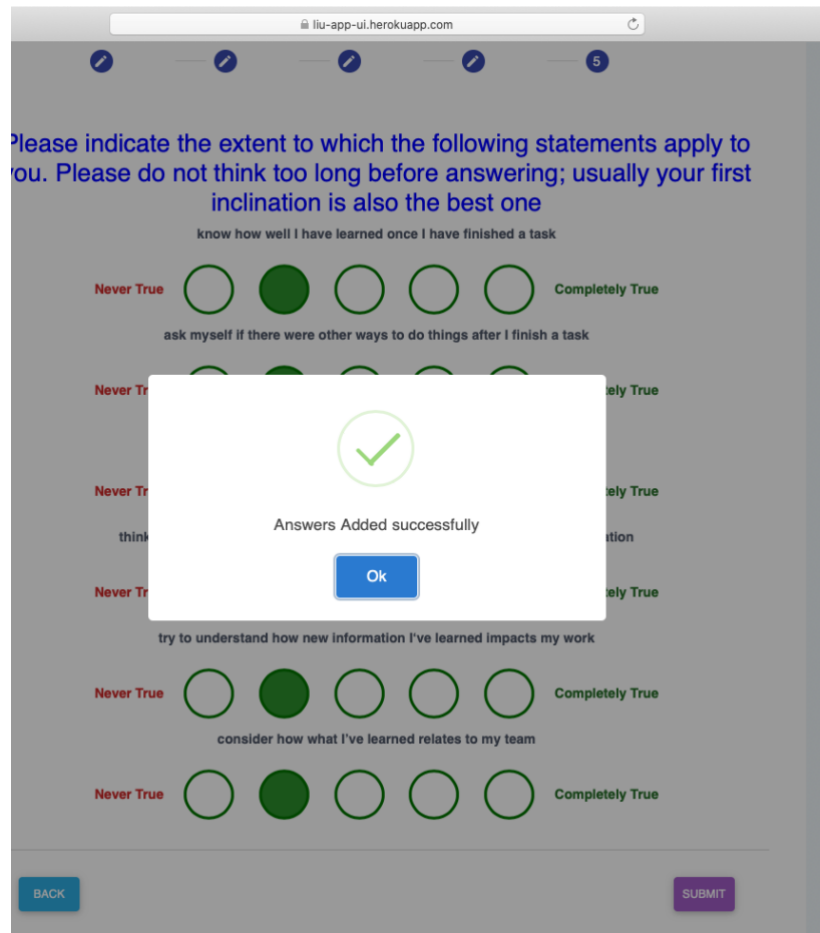
Never True ☐ ☐ ☐ ☐ ☐ Completely True

consider how what I've learned relates to my team

Never True ☐ ☐ ☐ ☐ ☐ Completely True

BACK SUBMIT

**Figure 6.16: Prototype 2 –SRL questions**



**Figure 6.17: Prototype 2 – session saving**

Based on the answers to the LiU questionnaire, that identified the PEU and analysed the SRL scores and provided a personalised suggestion of strategies that participants could employ while learning in uncertainty. **Figure 6.18 and Figure 6.19** shows an example of SRL profile representation and strategies recommended on type of PEU ( refer **Appendix 13** for the full report).



**Figure 6.18: Graphical representation of SRL profile in LiU report (Participant 2.3)**

A total SRL score was calculated for the participant by aggregating the scores from the ten SRL sub-processes described in **Table 5.2 (Chapter 5)**. These SRL scores are measures of self-perception, rather than absolute measures of SRL performance. SRL profiles were created illustrating participant's self-perception of their ability to perform within each of the sub-factors. For example, **Figure 6.18** shows the graphical representation of **Participant 2.3's** SRL profile, and **Figure 6.19** shows a part of their LiU report, recommending SRL strategies based on their type of PEU.

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## Type of Uncertainty

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Research shows that your feeling of uncertainty can be typically categorised into one of these types:

1. State Uncertainty – When you are unsure about what changes are happening in your work environment.
2. Effect Uncertainty – When you are unsure about how the changes will impact you.
3. Response Uncertainty – When you are unsure about how you are going to respond to the changes in your environment

Your scores show that currently you are experiencing high level of **Effect Uncertainty** and **moderate level of Response Uncertainty**. This means that you are highly uncertain about the impact of the changes in your work environment. You are slightly uncertain about how you will respond to these changes.

Typically, professionals experiencing these types of uncertainties resort to the following self-regulated learning strategies:

1. Networking and Help-seeking
2. Self-Reflection
3. Self-Evaluation
4. Goal Setting
5. Strategic Planning

Your SRL competency scores for these strategies are as follows:

Help Seeking	Ability to call upon your social networks, colleagues, experts in your area to enhance your knowledge.	60%
Self-Evaluation	Ability to identify your own strengths and weaknesses in order to develop your skills and abilities to enhance your strengths and address your weaknesses.	80%
Self-Satisfaction	Sense of contentment with your learning accomplishments, that fuels your motivation to further your learning goals.	60%
Goal Setting	Ability to set learning goals and work towards achieving them. It also includes your ability to realign your goals when learning requirements have changed.	73%
Strategic Planning	Ability to identify a need for learning and taking purposive actions to undertake that learning	69%

**Figure 6.19: Screen capture of the LiU report – Type of PEU section (Participant 2.3)**



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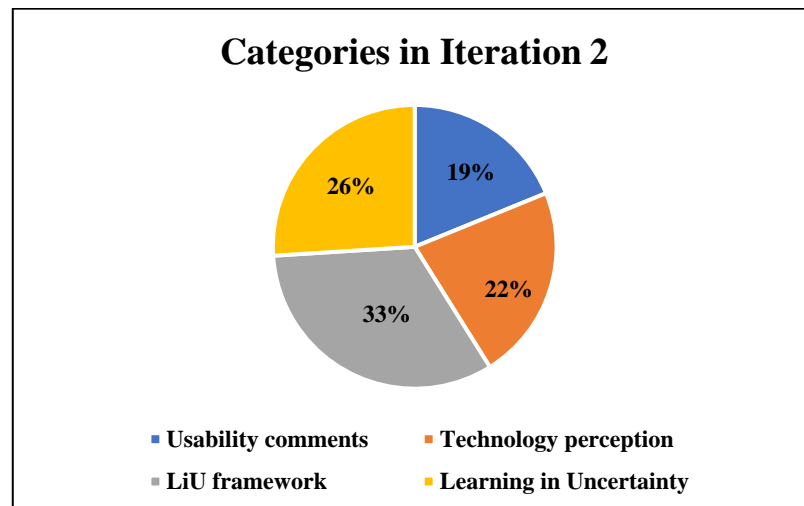
## 6.4.2 Analysis of Iteration 2 Interviews

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### 6.4.2.1 Qualitative Content Analysis

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Similar to the analysis of Iteration 1 (Section 6.3.2), the ten interview transcripts were openly coded first to identify the broad themes in the data. In the second phase of analysis, the TAM framework was used to code the interview transcripts deductively. A total of 753 statements were coded. **Figure 6.20** depicts the broad categories identified in the analysis. The objective of Iteration 2 interviews was to 1) validation of the changes implemented based on feedback from Iteration 1; 2) validation of the LiU framework. 33% of the codes were related to the LiU framework, which were coded at all the participants, 26% were related to their general perception towards learning in uncertainty, 22% were about technology perception, and 19% was related to usability feedback.



**Figure 6.20: Categories from interviews of Iteration 2**

**Table 6.8** gives a descriptive summary of themes and categories. Within usability comments, statements coded as positive feedback (53%) were substantially higher than negative feedback (27%). The highest number of codes were for LiU framework (32.9%), with a close second of learning in uncertainty (26%). Within the LiU framework, comments related to SRL profile, orientation towards learning, and personalised learning journey were coded at more than 22% each. Within learning in uncertainty, help-seeking, importance of reflection, and technology support for LiU were coded at more than 15% each.

**Table 6.8: Categories and Themes for Iteration 2**

<b>Code</b>	<b>Number of Codes</b>	<b>% of total codes</b>	<b>Number of participants coded</b>
<b>Usability comments</b>	142		10
Positive feedback for prototype	75	53.00%	10
Negative feedback for prototype	38	27.00%	10
Suggestions for improvement	28	20.00%	10
<b>Technology perception</b>	168		10
Perceived ease of use	47	28.00%	10
Perceived usefulness	38	22.50%	10
General attitude towards technology	34	20.30%	10
Intent to use technology	49	29.20%	10
<b>LiU framework</b>	248		10
SRL profile	59	24.00%	10
Identify type of PEU	15	6.00%	10
Orientation towards learning	58	23.40%	10
Personalised learning journey	55	22.00%	10
Suggestion of personalised strategies	49	19.60%	10
Useful for annual review with manager	12	5.00%	10
<b>Learning in Uncertainty</b>	196		10
Help seeking	32	16.42%	10
Importance of reflection	32	16.50%	10
Learning from experience	18	9.00%	8
Learning on the job	13	6.40%	5
Orientation towards learning	17	8.56%	7
Preference for top-down learning	14	7.00%	5
Reflecting on past experiences	23	11.50%	4
Role of mentor in LiU	13	6.42%	3
Technology support for LiU	36	18.20%	10

The following section draws qualitative insights into the numbers presented in this section.

#### 6.4.2.2 Thematic Analysis

The objective of Iteration 2 interviews was to 1) validation of the changes implemented based on feedback from Iteration 1; 2) validation of the LiU framework. Validation of the LiU framework was achieved by sharing personalised reports with the participants and asking them to check if the reports reflected their situation accurately. The previous section presented the results from QCA of interviews from Iteration 2. In this section, the numbers from QCA are unpacked to explore deeper insights into professionals' perceptions about the learning in uncertainty and the role of technology in supporting it.

#### **6.4.2.2.1 Usability Comments**

The focus of Iteration 2 interviews was on validating the LiU framework and feedback on the perceived use and usefulness after the changes that were implemented. However, since most of the participants were from Iteration 1, the usability discussions were mostly related to comparing the differences between the wireframe and 2 (142 out of 753 statements). For ease of comparison, the usability comments category consisted of the same three themes from Iteration 1.

#### **Positive feedback for the prototype**

53% of the total comments coded under the 'usability comments' category was positive feedback for the prototype. The majority of statements coded under positive feedback were related to the introduction of the LiU report.

I thought it hit the nail on the head. It's funny because I sent some of the stuff to my sisters, and they were like that is exactly you like that is it. It is funny how; I mean this is not the first time I have done like a psychometric test. I did one just a couple of weeks ago for a different project. It is very interesting just to see, that after a couple of questions, it is not so much that you are grouped into a certain way of thinking, but the way your behaviour is can be grouped. Which I thought was really really interesting. There were lots of things that I was not only learning about myself but seeing how overtly these behaviours are and it is about recognising it most of the time. (**Participant 2.2**)

The SRL profile that you shared with me was indeed good... to be honest I had not seen something like this before created in the professional realm. (**Participant 2.9**)

There was a general agreement that the clarity of flow was better in Iteration 2 prototype as compared to Iteration 1 wireframe. As **Participant 2.10** said, 'it was neater... more intuitive than last time'.

#### **Negative feedback for the prototype**

The negative comments constituted about 27% of the total usability comments. Similar to positive feedback comments, almost all the feedback was about the LiU report rather than to the prototype.

Yes, as I said the strategies were good and to be very honest a lot of this, I found to be very generic And I was expecting something very specific to something like the resources that they have within CISI. **(Participant 2.4)**

In the similar vein, **Participant 2.6** also was expecting some role-specific strategies.

I would like to add one point here that a lot of these strategies might not be applicable to every single person because we have multiple roles within organisations ranging from (unclear word) or domain areas to support areas like ethics and regulations. So, some of the generic strategies would be applicable to all the roles but when it gets to specific roles, I think you would find that some of the strategies might not relate to the role that the person is doing. **(Participant 2.1)**

Some of the other issues which were coded as negative comments were related to the functionality errors in the implementation such as auto-generation of emails, unreliable storage of data.

### **Suggestions for improvement**

20% of the statements related to suggestions for improvement. In Iteration 1, while the participants indicated intent for use in the introspection phase, some of the suggestions in Iteration 2 related to the implementation of the strategies suggested.

What I would like to see is where I could go from there. You shared certain graphs and numbers and stuff like that in the report. But what would be useful for me as a user would be to understand how I can take this forward, like what changes I can make in my day to day life in order to bring about a positive impact. Because there are certain lines and sentences that say that if you want to improve this score, then maybe you should do this. But maybe just to build on that. **(Participant 2.3)**

Despite efforts to clarify the terminologies used, there were still some participants who felt that the terms used were a bit unclear. For example, **Participant 2.2** ask for clarification on what ‘self-efficacy’ meant and how it differed from ‘goal setting’. There were also some suggestions made for adding details about the perception of uncertainty.

.... maybe you could add some more details around the uncertainty types as such because it was not very clear in the report but I'm sure that would get improved upon as this progresses further. **(Participant 2.7)**

...because the sector that we work in uncertainty and risk are inherent so you would find that most of us kind of work in a very uncertain situation most of the times so again this kind of becomes a habit because you do this day in day out and you never get used to it ...so there are very few days that kind of you'd call or categorise as normal but then you would find that this is the answer from most of the professionals that you talk with. So maybe when you say perception of uncertainty in the report maybe you could give a bit more background about how you define it. **(Participant 2.6)**

#### **6.4.2.2.2 Technology perception**

Since most of the participants had already answered the questions regarding technology perception, questions regarding general attitude to technology were not repeated in Iteration 2. However, they were asked about perceived ease of use in comparison with the wireframe.

I definitely feel it will help, there are so many soft skills trainings, which are eye openers in the workplace. I feel such trainings would definitely prepare the employees in uncertain times in terms of what to expect or how to react to such situations. I think it adds more value to have such learning process as part of your organizational learning. **(Participant 2.5)**

The experience of using the website was much better than using the app, and I see that you have made few changes which is good. **(Participant 2.8)**

You would find that this website will find more acceptance within the sector than the mobile app because it looks like it's much easier to use and doesn't take much time as well to fill in the questions. **(Participant 2.3)**

#### **6.4.2.2.3 Learning in Uncertainty**

The second objective of Study 3 was to validate the LiU framework and capture the perceptions of professionals in terms of its usefulness and efficacy in recommending relevant

strategies. This was achieved by generating personalised LiU reports, which were shared with the participants before the interview. Most of the participants shared positive feedback regarding the LiU report and also the strategies that were presented to them after completing the questionnaire.

**Participant 2.9** looked at the report as a reflective tool that invoked ‘lot of insights’ and ‘food for thought’. They acknowledge that knowing more about themselves help further their learning processes.

...oh, the profile was a good surprise to be very honest. when I was actually filling in the questionnaire, I was not honestly expecting a detailed report like this so well done.... I think it gives you a lot of insights and lots of food for thought to be very honest in terms of understanding where exactly I stand vis-a-vis the traits that I show from a learning perspective and I think this would help in my learning process as well. (**Participant 2.9**)

Similar views were shared by **Participant 2.10**, where they recognise the challenges in undertaking learning under time-pressured work environment. So, any resource that could help identify areas of weakness to improve upon would be useful.

I think the report is very useful in multiple ways to start with as you can understand clearly that a lot of us are very busy and the time that we spend in learning tends to become very limited as we progress within our career and these kind of reports makes us rethink and look at the areas that we need to focus on...(Participant 2.10)

**Participant 2.2** liked the prototype ‘functionality’ to ‘capture the type of uncertainty’, which was a sentiment shared by many participants.

Discussions regarding the LiU framework inevitably led to participants sharing their views on what they thought about learning in uncertainty. Although this was not one of the objectives of the study, these discussions helped strengthen the narrative that was carried forward from Study 1 and Study 2 – which is that professionals acknowledged the importance of learning in uncertainty. For instance, **Participant 2.5** talked about the role of networking and help-seeking when learning in uncertainty.

I would say learning has a very big role in helping people manage what you call uncertain situations because you'd find that this sector is kind of prone to changes and people are always catching up and trying to align with the changes that's happening either in the industry or within their own organisations. (**Participant 2.5**)

They further elaborated on the importance of learning in the context of uncertainty situations:

learning obviously becomes very important in these situations. You either learn through your own networks or your own way or you learn from other people who have actually gone through this in the past so especially when you see uncertain situation you would see that we talk to each other a lot and obviously learn from each other and at the same time learn from other resources as well. (**Participant 2.5**)

**Participant 2.7** had much stronger views on the importance of networks in uncertainty, as they claimed, ‘your network is more important to you than the organisation you work for’. They believed that, ‘uncertainty is not temporary’ and that ‘uncertainty and rapid change are just the fact of the world in which we live in’. They emphasised the importance of networks in an uncertain world.

So, you will pick your organisation and if that organisation is helping you learn, helping you develop, doing well for you, then you will do well for it, but the minute that changes, you will be on something else. And your network will stay stable and maybe your network will be the ones who help you get the next opportunity. (**Participant 2.7**)

In a similar vein, **Participant 2.1** reiterated the importance of seeking help from colleagues and seniors within the organisation when they perceived uncertainty.

It is typically when we perceive an uncertainty in our workplace that we tend to use different strategies. When it comes to it like one of the key ones that we do is go and talk to somebody try to understand if they have done something similar in their past and try to see if those learnings can be used right now ...it's not always possible because these days you kind of tend to be facing newer kind of issues which obviously requires a newer strategies but then obviously experience does matter and you always have your seniors to depend on and that's the role that they play within the organisation as well. (**Participant 2.1**)

## 6.5 Summary of results

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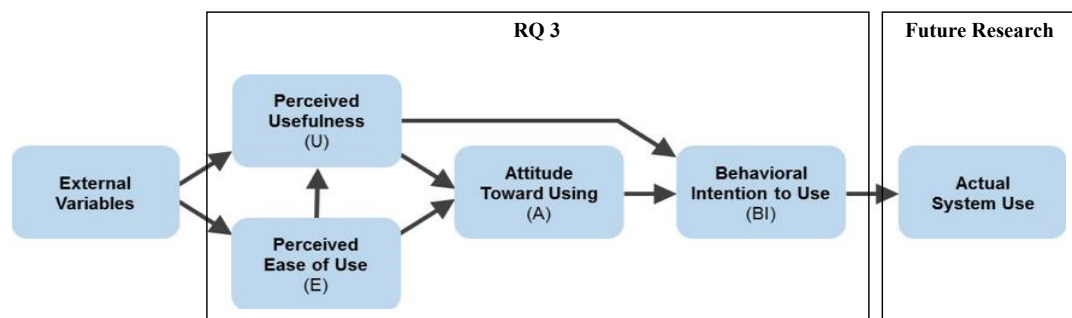
**Sections 6.3 and 6.4** presented results from iterations 1 and 2, respectively. This section summarises the results to answer RQ3 and RQ4.

### 6.5.1 RQ3

**RQ3: How do finance professionals perceive the role of technology in supporting their self-regulated learning during uncertainty?**

RQ3 was answered from two perspectives –perceptions of professionals regarding technological support in fostering SRL during uncertainty and general perception of technology usage. As mentioned in **Section 6.1**, the academic objective of Study 3 was to examine the role of technology in supporting SRL in uncertainty. There was also a practice-based objective of the study based on the requirement from CISI to investigate ways in which they can support their members in learning in uncertainty. The research output for CISI was a set of evidence-based recommendations for implementing a technology-supported solution to help finance professionals manage their uncertainty by fostering SRL in finance professionals. Answering RQ3 served both the academic and practice-based objectives.

In order to examine the perceived role of technology in supporting professionals SRL in uncertainty, questions regarding perceived usefulness and perceived ease of use were adapted from TAM (**Section 2.9**). TAM is typically used to determine whether a user will accept or reject a piece of technology. However, in Study 3, a complete implementation of TAM could not be tested using quantitative modelling techniques, as it required a finished product to test the behavioural intention and actual system usage. Instead, in Study 3, TAM was adapted for qualitative exploration of the perceived ease of use and perceived usefulness to answer RQ3. **Figure 6.21** depicts the adaptation of TAM used in Study 3.

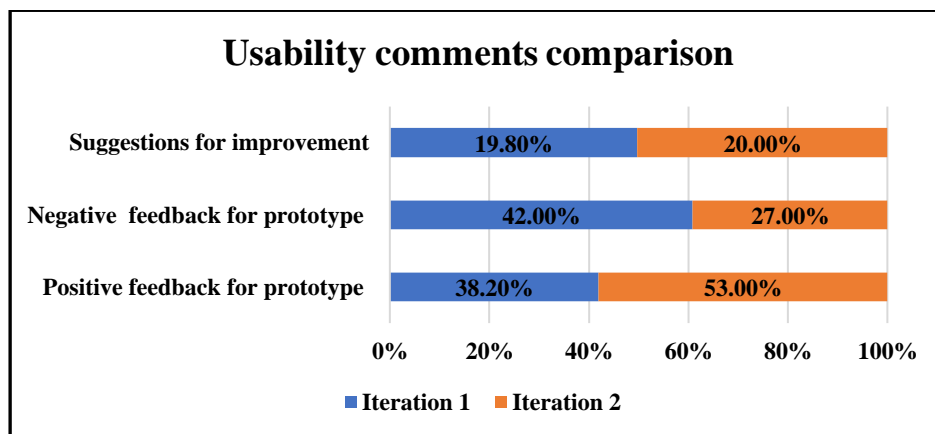


**Figure 6.21: Variables from TAM used in answering RQ3**

Lin (2013) explored the relationship between usability features of e-learning technology and TAM variables – perceived usefulness and perceived ease of use, to find a significant causal relationship between perceived ease of use and usability. Similarly, many studies explore the relationship between TAM and usability of technology (Aqil Burney et al., 2017; Holden & Rada, 2011; Hornbæk & Hertzum, 2017). Hence, the usability comments were used to make inferences about the perceived usefulness and perceived ease of use of Iteration 2 in comparison with Iteration 1.

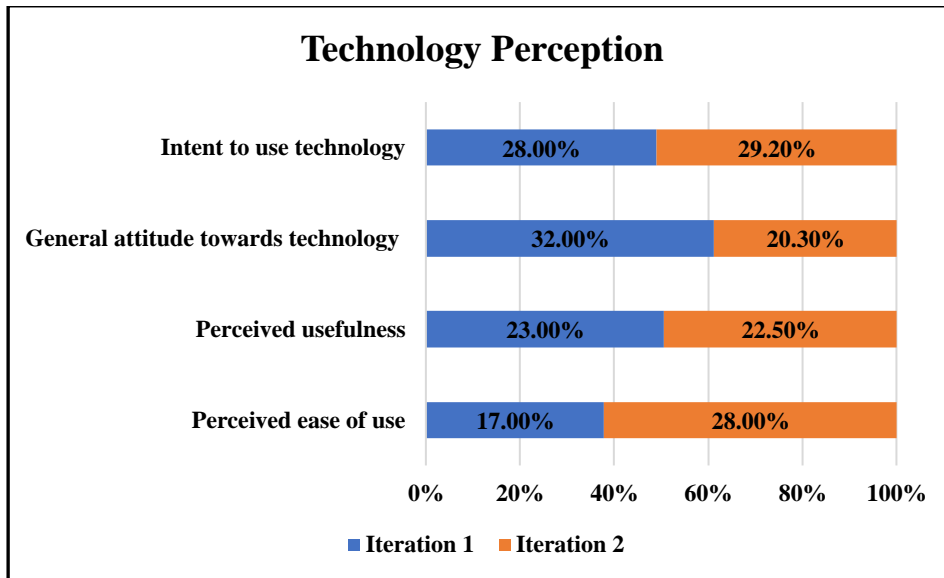


**Figure 6.22** shows the comparison of the number of statements coded for usability comments category. Suggestions for improvement remained almost the same, while the number of positive comments were relatively higher in Iteration 2 as compared to Iteration 1. A qualitative examination of the positive comments (as discussed in **Section 6.4.2**) reveals that the positive feedback was more regarding the LiU report than for the technology prototype. TA results also show that in suggestions for improvements – integration with organisation learning management system (LMS) was a dominant suggestion. This indicates a preference for top-down approach when it comes to learning undertaken in times of uncertainty.



**Figure 6.22: Comparing the percentage of comments from both the iterations.**

**Figure 6.23** depicts the comparison of technology perception from both the iterations. The intent to use technology was similar in both iterations, which indicates that irrespective of the technology platform, the professionals intended to use technology support for their learning. The general attitude towards technology was slightly higher in Iteration 1 as compared to Iteration 2. Except for two participants, rest all were from Iteration 1. Hence the questions about the general attitude towards technology were not repeated in the interviews for those who had participated in Iteration 1. Hence, this dip in the percentage of general attitude to technology is related to the questions asked about it, rather than being indicative of participants perception. Perceived usefulness remained almost the same in both the iterations (23% and 22.5%), while perceived ease of use was up by 10% in Iteration 2 (28%). These results show that irrespective of the platform, the professionals found the perceived usefulness to be the same in both the iterations. However, the perceived ease of use substantially increased in the second iteration. This could be due to a different platform, a higher fidelity prototype, or because it was focused on only the 'introspection' phase of the LiU phases.



**Figure 6.23: Comparing the technology perception from both the iterations**

These results show that irrespective of the technology platform, the perceived usefulness remained the same, which meant that the form or shape of technology did not have a major role, but if the perceived usefulness of the framework is high, technology acted as a medium or an enabler to make that available to the professionals.

#### 6.5.2 RQ4

**RQ4: How do the finance professionals perceive the usefulness of the LiU framework in recommending SRL strategies based on the type of PEU?**

In Iteration 2, a specific set of questions were created to validate the LiU framework. For example, – "Do you think that the suggested SRL strategies are appropriate for you? What were you expecting? Do you think that the type of uncertainty you are facing was correctly identified by the app?" (refer **Appendix 12** for the complete interview schedule). The participants were encouraged to share feedback about the LiU report and relevancy of the recommended strategies.

6 out of 10 participants said that they could relate to the SRL strategies recommended in the report, and they found those recommendations useful. 3 participants thought that even though the strategies suggested for them were relevant, but for they thought that most of them were ‘very generic’ (**Participant 2.4**) and that they were expecting strategies in the context of CISI training offerings. One participant went further and suggested that the strategies need to be ‘dynamic’, and there should also be a ‘feedback mechanism for the participants to add additional strategies that they employ’ (**Participant 2.7**).

The majority of participants (9 out of 10) found the structure of the LiU report to be useful. **Participant 2.1** particularly appreciated the presentation of the spider chart SRL profile representation.

The profile was good I mean especially the graph that you presented with various factors mapped into one picture which I thought was very intelligent. (**Participant 2.1**)

One participant suggested that the report should go one step further in providing specific instructions for implementing these strategies.

When asked how they see themselves using the report, most of the participants said that it was more of a 'reflective tool' (**Participant 2.6**) for personal use or as a 'self-reflection strategy' (**Participant 2.1**) at a team level. The importance of reflection was one of the most commonly discussed themes.

These results show that the majority of professionals found the recommendations of SRL strategies useful and also found them to be relevant. The professionals who did not find them particularly useful reported that they did not have an issue with the recommended strategies, but they expected specific resources to help them develop the identified skills rather than a list of recommended strategies. Since it was perceived to be most useful as a reflective tool, the report could be enhanced further with guided reflection strategies. Currently, the set of strategies from which the recommendations are made are SRL strategies based on Zimmerman's (2000) framework. However, professionals may not see the relevancy of the distinction between SRL strategies and domain-specific strategies. Hence to make it more relevant for them, the technology support should have a feedback mechanism which would enable the users to add to the repository of strategies based on certain types of uncertainties, which would further enhance the usefulness and relevancy of the LiU framework for the professionals. Nevertheless, the results from this study present a useful starting point to build on further investigation.

Having presented and summarised the findings from Iteration 1 and 2, the following section discusses the findings in the light of extant literature.

## 6.6 Discussion and Implications

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In order to explore the role of technology in supporting SRL in uncertainty, this study adopted a co-design approach by iterating the technology support prototype designs with user feedback. This ensured that the actual needs of the professionals in terms of technology support were captured. Factors such as their overall technology perception, preference for the technology platform, and preferred avenues for using technology support were considered in the development of the prototype. Since the majority of the participants took part in both the iterations, they were able to see how their feedback directly informed the next iteration of the prototype.

The LiU framework was created from the findings of Study 1 and Study 2, which proposed a relationship between Zimmerman's (2000) SRL strategies with Milliken's (1987) perceived environmental uncertainties. The objective of Study 3 was to validate the framework and to examine the role of technology in supporting professionals' adoption of SRL during uncertainty. This objective was achieved by making the LiU framework available to the professionals using technology as a medium. Thus, instead of handing over a theoretical framework to the professionals, a technology platform was used to elicit information about their SRL competencies and uncertainty perception, analysing that information using the business logic, and finally presenting the recommended strategies mapped to the perceived uncertainty in the form of an easy to understand LiU report. The findings show that technology plays the role of an enabler when people are planning their self-regulated learning journey in uncertainty. Thus, the role of technology is to make the LiU framework available to the professionals in the medium that they use in their day-to-day activities, because a standalone theoretical framework that is not integrated into the technological ecosystem that the professionals work in, drastically reduces the perceived usefulness. Technology plays a vital role in enabling access to the best practices and knowledge base to the professionals.

TAM (Davis, 1989) framework was employed to measure the perception of technology in terms of perceived ease of use and perceived usefulness and perceived ease of use. Findings report high perceived usefulness for using technology support for SRL regardless of the platform it was implemented on. However, perceived ease of use was higher for the web platform as compared to mobile platform which was perceived to be a stand-alone entity. This meant that professionals perceived technology support to be useful for scaffolding their SRL behaviour, as long as it aligned with the organisation's learning management system. Similarly, Siadat et al.'s, (2016) found that perceived usefulness was higher for technology interventions that provided information about the organisational context as compared to interventions that merely provided usage information. They also found high perceived usefulness for intervention that supported 'reflection' sub-process and for goal recommender interventions, as users found it to be useful for planning their learning activities. As perceived usefulness is regarded to be a more powerful predictor for technology usage than perceived

ease of use (Davis, 1989), finding from this study suggests that users will be more accepting of a technology supported learning in uncertainty framework.

Previous studies show that in the professional learning contexts, learners often do not give sufficient importance to the regulation of learning (Bjork et al., 2013; Margaryan et al., 2013), which leads them to misevaluate their learning needs. However, studies have shown that technology-based support can foster learners' engagement in SRL elements – self-observation, self-reflection, or goal orientation (Dabbagh & Kitsantas, 2012; Hadwin & Oshige, 2011; Azevedo, 2005; Littlejohn et al., 2009). In-line with these findings, results from Study 3 showed that of the three phases of learning in uncertainty (Identify-Introspect-Implement), professionals found technological support to be most useful in the introspection phase. Also, results for RQ4 revealed ‘importance of reflection’ as a dominant theme when learning in uncertainty. Within the importance of reflection, professionals indicated a preference for both individual reflection and collaborative reflection. This is in line with findings from (Renner et al., 2020b). They conducted an extensive study on computer-supported reflective learning at work using mobile apps, across 20 field studies, 12 applications, and 321 participants. They found that professionals had, “a positive reaction to the apps and perceived their use to be beneficial for their work by using them” (p. 167). They also found that the implementation of the reflection apps required “careful adaptation to the specific organisational and situational contexts” (p.167). Integration with organisational learning context is a theme which was prominent in Study 3 findings as well. Similar to (Renner et al., 2020b) results, participants in Study 3 indicated positive perceived usefulness for technology support for introspection, with the condition that it should be integrated with their organisational goals and objectives.

Related to the integration with organisational context was another critical finding that professionals preferred customised and personalised learning journey plans which would aid in planning their learning, especially in times of uncertainty. However, in the financial sector where uncertainties are varied in nature, technology-enabled learning framework with a static set of strategy/resources recommendations would not be sufficient. For it to be useful, a system has to be intelligent enough to accommodate and learn from new knowledge and add it to the repository on a real-time basis. Also, it requires much personal information about workers' tasks, goals, and organisational information, to provide personalised strategies, which is not an easy task to achieve. Siadaty et al., (2011) recognised the challenge of obtaining data for the creation of personalised strategies in their study examining the associations between technological interventions such as providing useful information or recommending available competences on the SRL planning and engagement phases respectively. In the context of collecting data for their study, they said that:

To be able to do this, the learners need personalized information – i.e., information relevant to them and their present learning context – about the organization’s objectives and expectations;

the learning activities and achievements of co-workers; and learners' own progress w.r.t. their current learning goal(s). However, access to this kind of information is far from straightforward, primarily due to the fact that today's knowledge workers often use diverse tools for their everyday working and learning practices; thus, the traces and outcomes of their activities are dispersed among different and often heterogeneous tools. (Siadaty et al., 2011, p.66)

The lessons learnt from Study 3 have significant implications for practice, for both individuals as well as CISI. It shows that supporting the SRL behaviour of professionals can have positive implications in terms of motivational aspects. It also indicates that technological support can help them become more reflective and strategic in managing their uncertainty.

The following section discusses the limitations of Study 3.

## **6.7 Study limitations**

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A limitation of this study was the cross-sectional research design rather than a longitudinal one. A longitudinal study where the professionals use the strategies in their workplace uncertainty contexts and feedback on the efficacy of those strategies needs to be planned in order to validate the LiU framework fully. Also, the self-report measures through interview data could be biased, as the professionals might not be comfortable in giving negative or harsh feedback on the prototype to the researcher who has developed them. Hence in future work on this research, a trace-based analysis could be planned once the technology support is fully developed and implemented. This would also enable the application of the extended TAM model in exploring any other external variables that might influence the acceptance of the technology.

## **6.8 Conclusion**

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The main research objective of Study 3 was to 1) evaluate technology support for LiU framework in terms of perceptions of professionals in using technology and characteristics of the technology platform and 2) validate the LiU framework. To that end, a co-design iterative study was planned, where a technological prototype in the form of a mobile app was developed as the wireframe. Iteration 1 captured feedback about platform preferences, the phase in which technology support can be most effective, and any other design suggestions, through the first round of semi-structured interviews. Prototype 2 was developed based on the revision feedback from Iteration 1. The second set of interviews were carried out to obtain feedback on prototype 2 and to validate the LiU framework. The key finding of this research was that professionals perceive technology to play an

essential role in supporting their learning activities in uncertainty, as long as it implemented within their organisational learning systems. Similar to Study 1 and Study 2, themes of help-seeking, networking, and self-reflection were also found to be prominent in Study 3.

## Chapter 7: General discussion and conclusion

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This thesis has explored the ways in which finance professionals self-regulate their learning in times of uncertainty. It has provided insights into the potential for using technology to support and guide professionals' learning in uncertainty. Through theoretical lenses of SRL (Zimmerman, 2000) and PEU (Milliken, 1987), this study has uncovered the relationship between SRL strategies and type of perceived uncertainty. This chapter will summarise the main findings from each chapter and discuss them in the context of broader literature. **Section 7.1** presents an overview of this dissertation. **Section 7.2** and **Section 7.3** elaborate the theoretical and methodological contributions of this thesis. **Section 7.4** discusses the limitations of this research and makes suggestions for future research. **Section 7.5** outlines the implications of the research findings for professionals and organisations. The thesis concludes with the researcher's final remarks and reflections in **Section 7.6**.

### 7.1 Overview of the research

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The research presented in this thesis lies at the intersection of self-regulated learning, perceived environmental uncertainty, and technology supported self-regulated learning. This area is has not received much attention in the contemporary literature (Lopes, 2010). As discussed in Chapter 2, uncertainty was conceptualised as PEU (Milliken, 1987). As per Milliken's (1987) definition of PEU, uncertainty arises from the relationship between the objective environmental factors and personal characteristics of professionals. Irrespective of the objective nature of environmental uncertainty, individuals differ in how they perceive and respond to that uncertainty based on a range of behavioural characteristics (Lueg & Borisov, 2014). There is significant research unpacking the impact of behavioural traits on uncertainty perception (Anderson et al., 2019; Melanie, 2015). However, SRL behaviour has not been studied in relation to perceived uncertainty. Hence, aim of the research undertaken in this thesis was to examine the SRL strategies employed by professionals and how they relate to the type of perceived uncertainty and the role of technology in supporting it. With this focus in mind, this thesis has addressed the following research questions:

**RQ1:** What is the nature of environmental uncertainties within the finance sector and the perception of finance professionals towards these uncertainties?

**RQ1.1** – What is the nature of uncertainties perceived by finance professionals?

**RQ1.2** – What are the antecedents and consequences of uncertainty as perceived by the finance professionals?

**RQ1.3** – In what ways do finance professionals respond to the periods of uncertainty?



**RQ2:** How do finance professionals self-regulate their learning in times of uncertainty?

**RQ2.1** – Does finance professionals' choice of SRL strategies relate to the type of uncertainty they perceive?

**RQ2.2** – What are the self-regulated learning strategies employed by finance professionals when they perceive uncertainty?

**RQ3:** How do finance professionals perceive the role of technology in supporting their self-regulated learning during uncertainty?

**RQ4:** How do the finance professionals perceive the usefulness of the LiU framework in recommending SRL strategies based on the type of PEU?

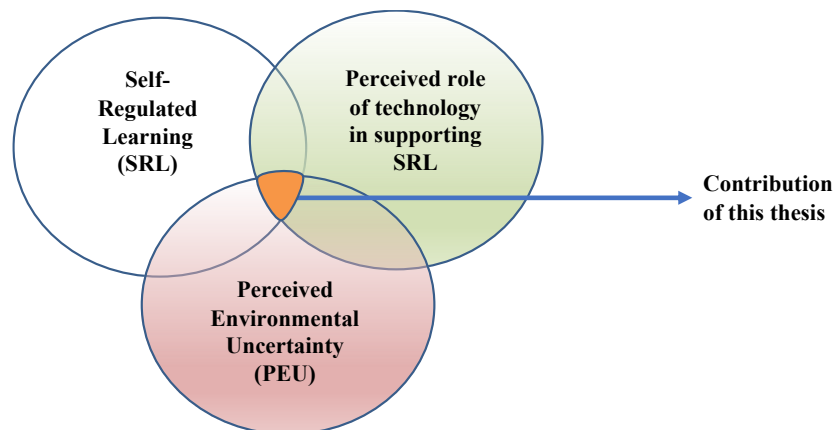
These research questions were addressed through three studies that together contribute to the research on technology supported learning in uncertainty.

The first study addressed RQ1 by examining the nature of uncertainties within the finance sector. Previous researchers have called for a deconstructed conceptualisation of uncertainty (Duncan, 1972; Milliken, 1987) by examining not just the types of uncertainty, but sources of uncertainty, and their antecedents and consequences in order to gain a holistic view of the nature of uncertainty situations. Despite the increasing recognition of the importance of multidimensional sources and nature of uncertainty (Gaba & Terlaak, 2013), there is a paucity of research deconstructing the sources of uncertainty in the finance sector and further examining it in the context of learning. The first study addressed this gap. Overall, the findings revealed that there are five distinct sources of objective environmental uncertainties in the finance sector which professionals perceive at three different levels – state, effect, response (Milliken, 1987). The first study also found that professionals consider uncertainty situations at workplace as learning opportunities and employ specific learning strategies such as help-seeking, networking, and self-reflection as a consequence of perceived uncertainty.

To further delve into how finance professionals learn as a consequence of perceived uncertainty, Study 2 drew upon the SRL framework. Previous research on workplace learning of finance professionals has focused on their SRL in relation to learning opportunities afforded at the workplace (Fontana et al., 2015; Littlejohn et al., 2016; Milligan et al., 2015). The second study in this thesis builds upon previous research by examining SRL strategies employed by professionals with respect to the type of uncertainty they perceived. This study revealed that type of perceived uncertainty had a differential impact on the SRL strategies employed by professionals. It also shed light on specific learning strategies employed for each of the three types of perceived uncertainties. These findings were synthesised into a conceptual framework (LiU framework). It also revealed the iterative approach taken by professionals for learning in uncertainty (*i*<sup>3</sup> approach).

The third study focused on evaluating the LiU framework and the perceived role of technology in fostering SRL in uncertainty. The findings from this study indicated that professionals

have an overall positive perception regarding the use of technology in supporting their learning activities, with the caveat that it must be integrated with the organisational learning systems. Another key finding was that professionals preferred using technology as a reflective tool, but the actual learning that happened in uncertainty was social in nature, as evidenced by the predominance of help-seeking and networking strategies. **Figure 7.1** depicts the intersection of the three prominent fields of literature at which the research undertaken in this thesis can be situated.



**Figure 7.1: Knowledge contribution of the thesis**

Previous work on PEU focused on aspects of decision making (Consigli et al., 2017), innovation (Freel, 2005), entrepreneurial action (McKelvie et al., 2011), emotion regulation (Fenton-O'Creevy et al., 2012), and organisational performance (Sawyer et al., 2003). However, few studies have considered the learning processes of professional in relation to perceived uncertainty. Previous research has also relied on either purely qualitative or quantitative methods. Employing mixed methods research design allowed for an examination of SRL and PEU from different perspectives and for answering a broad range of research questions. This was especially important from a theoretical view, as there is limited research on the topic of learning in uncertainty. Hence examining the topic from multiple perspectives has laid the foundation for future work. Together, the three studies undertaken in this research made three main contributions to scholarship:

- Detailed understanding of the nature of uncertainties within the finance sector, in terms of their sources, antecedents, consequences, and overall perception.
- Mapping of SRL with the type of perceived uncertainty resulting in the LiU Framework and  $i^3$  approach.
- Identifying the perceived role of technology in supporting SRL behaviour in times of uncertainty.

Also, the methods employed in this thesis contribute to the methodological literature. The following two sections present an overview of the theoretical (**Section 7.2**) and methodological (**Section 7.3**) contributions made by the thesis in the context of broader literature.

## **7.2 Theoretical Contributions**

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### **7.2.1 Unpacking nature of uncertainties within the finance sector**

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The first contribution is to the research calling for the deconstruction of sources of environmental uncertainties within various sectors (Downey & Slocum, 1975; Duncan, 1972; Milliken, 1987). By identifying the sources of uncertainty in the finance sector and the antecedents and consequences associated with it, this research contributes to the growing body of research mapping the nature and variations of sources of perceived environmental uncertainties within organisations (Chumakovaa & Kornilovb, 2013; Refsgaard et al., 2007; Regan, 2012; Voges et al., 2004). Previous researchers have found that differentiating the sources of uncertainty has implications for identifying controllability of these sources (see Beckman et al., 2004). Alpers, (2019) found that delineating the controllability of the various sources of uncertainty allowed professionals to strategise their coping plans more effectively.

In examining the learning aspects of finance professionals' during uncertainty, particular attention was given to how professionals perceived it. Uncertainty management literature revolves around two views – 1) Perceiving uncertainty as a threat - coping with uncertainty (Alpers, 2019; Ballesteros & Kunreuther, 2018; March & Simon, 1958) and 2) Perceiving uncertainty as an opportunity - managing uncertainty (Allen et al., 2007; Cumming et al., 2019; Mann, 2011; Syrett & Devine, 2012; Williams & Clampitt, 2003). The findings from this research add to the scholarly work on uncertainty management by suggesting that there might be a third view which is perceiving uncertainty as a learning opportunity. This was found to be a recurring theme in all the three studies, where professionals reported perceiving uncertainty as an opportunity to learn. Sometimes the learning was voluntarily undertaken (e.g., new job role) while sometimes it was triggered by external factors (e.g., organisational changes or regulatory factors). Professionals reported lack of knowledge and disconnect with the academic world as key antecedents of uncertainty, while recognising the need for upskilling and reskilling as a consequence of uncertainty. Within the behavioural finance literature, one of the most recurring constructs studied in relation to uncertainty is the decision-making ability of professionals (Fenton-O'Creevy et al., 2011). Findings from this study allude to the significance of understanding the learning behaviour during uncertainty, as it will be beneficial to the organisations as well as individuals.

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### **7.2.2 Examining the association between self-regulated learning and perceived environmental uncertainty**

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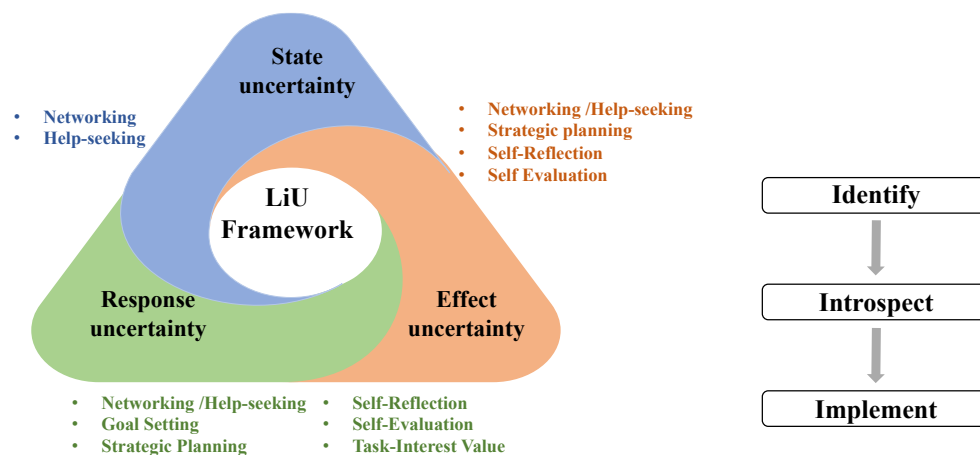
The unique contribution of the research presented in this thesis to the scholarly work lies in connecting the SRL literature with PEU literature. It has laid the groundwork for future researchers to

unpack the learning processes in the context of uncertainty perception. Previous research that investigated the learning behaviour of finance professionals highlighted the significance of SRL in navigating the dynamic work environment within the finance sector, based on a series of quantitative (Fontana et al., 2015; Collin Milligan et al., 2015) and qualitative (Littlejohn et al., 2016) studies. These studies were conducted in the context of a major global crisis – the financial crash of 2008. However, their primary focus was on understanding the SRL behaviour without the explicit emphasis on the uncertainty construct. Milligan et al.'s, (2015) study found that workplace context influences the measure of workplace learning undertaken, which in turn is influenced by the SRL behaviour of professionals. This finding signifies the importance of further exploring the workplace context. This thesis extended the research carried out by Milligan et al.,(2015) by conceptualising the inherent uncertainty in the workplace learning context in terms of how it is perceived by the finance professionals and examining how it relates to their SRL behaviour. This research augments the previous findings and broadens the knowledge of understanding SRL behaviour of professionals by showing that SRL behaviour itself is dependent on the type of uncertainty perceived by professionals within the workplace learning context. This means that professionals employ distinct SRL strategies based on the type of uncertainty they perceive (see **Chapter 5**).

Networking with practitioners within and outside their organisations and seeking help from colleagues emerged as the most significant strategy used by professionals irrespective of the type of uncertainty they perceived. This finding resonates with previous research on professional learning of finance professionals, as Littlejohn et al., (2016) found LinkedIn to be a popular technology tools amongst professions. Based on the finding from this research, it can be argued that the popularity of LinkedIn as a preferred platform could be because it fits with what they do in practice. Previous literature on the role of networking and help-seeking has mostly focused on organisation performance and entrepreneurial networking (Mlotshwa & Msimango-Galawe, 2020). Sawyerr et al. (2003) found a similar result in their research examining the role of networking activities in perceived uncertainty. They found that perceived uncertainty is positively co-related with ‘internal networking’ (within organisation) activities, which in turn is positively related to firm performance. Moreover, previous research has found networking to be a coping mechanism for dealing with uncertainty (Ford & Mouzas, 2010; Sydow et al., 2013). This means the researchers operate from an underlying assumption that uncertainty is something to be avoided or dealt with. However, finance professionals function in what Chong and Tuckett (2015) describe as ‘radical uncertainty’. Hence there is a downside to perceiving uncertainty as something to be avoided. The findings from this research suggest the value of researching the role of networking in learning. Since the very definition of uncertainty is the inability to assign probabilities to events due to lack of information (Milliken, 1989), networking and seeking help from colleagues can help address the information gap and learn new information which can be used for making strategic decisions in case of future uncertain events.

Another original contribution made by this thesis to theoretical knowledge is the creation of a conceptual framework – Learning in Uncertainty (LiU) framework that presents a mapping of the SRL strategies to the type of perceived uncertainty (**Figure 7.2**). Networking and help-seeking were the most prominent strategies employed by professionals when they perceived state uncertainty, while forethought and self-reflection strategies were mapped to effect and response uncertainty. For example, when perceiving effect uncertainty, professionals typically undertook strategic planning and self-reflection. Highest level of interest and value for learning was reported when perceiving response uncertainty.

Three distinct phases were identified through which professionals formulated strategies for managing their learning in uncertainty – Identify (potential sources of risk/uncertainty at their workplace), Introspect (On their own thoughts, to identify the complexity of a workplace situation that creates a perception of uncertainty), and Implement (learning strategies) (**Figure 7.2**).



**Figure 7.2: LiU Framework and i<sup>3</sup> approach**

Such examination of SRL behaviour in relation to the type of perceived uncertainty has not been addressed in previous research, to the best of researcher's knowledge, and hence constitutes an original contribution to knowledge.

### 7.2.3 Evaluating perceived role of technology in supporting SRL

Evaluating the perceived role of technology for supporting SRL behaviour was one of the key contributions to knowledge. Davis's (1989) TAM framework was used to measure the perceived usefulness and perceived ease of use of the technology intervention. Findings showed that the perceived usefulness of technology support was high regardless of the medium it was implemented on. This means that professionals found technological support to be useful in planning and carrying out their learning activities. Although the technology support evaluated in this thesis had not been fully

developed, the high degree of perceived usefulness points to the ubiquity and acceptance of technology in the wider perspective of professional learning activities and specifically within the self-regulated professional learning context. However, when the technology platforms were compared in terms of perceived ease of use, the web platform was found to be much easier to use as compared to the mobile platform. These findings are congruent with Siadaty et al.'s, (2016) work on perceived usefulness of technological scaffolding of micro-level SRL processes. They found that users perceive interventions that support the following SRL processes to be highly useful – reflection, goal recommendations, organisational information.

Previous studies show that in professional learning contexts, learners often do not lend sufficient importance to the self-regulation of learning (Bjork et al., 2013; Margaryan et al., 2013), which leads them to mis-evaluating their learning needs. However, studies have shown that technology-based support can foster learners' engagement in SRL elements – self-observation, self-reflection, or goal orientation (Dabbagh & Kitsantas, 2012; Hadwin & Oshige, 2011; Azevedo, 2005; Littlejohn et al., 2009). Similarly, Siadaty et al., (2016) found significant associations between technological interventions such as providing useful information or recommending available competences on the SRL planning and engagement phases, respectively. The findings from this study are in-line with the previous research, as findings from Study 3 indicated that of the three phases of learning in uncertainty (Identify-Introspect-Implement), technology-based learning support is perceived to be most useful when it is presented as a reflective tool (see **Chapter 6**). This complemented the finding from **Chapter 5**, where self-reflection was found to be one of the most prominent strategies for learning in effect and response uncertainty. The importance of self-reflection is supported by previous research, as self-reflection during period of uncertainty presents a valuable opportunity for learning from experience (Desjarlais & Smith, 2011). The findings from this study showed that professionals reflected to become aware of the tacit knowledge from their past experiences in order to devise strategies for current uncertainties. This relates to the notion of learning from experience.

It was clear that in the financial sector where uncertainties are varied in nature, a learning intervention with a static set of strategy/resources recommendations would not be sufficient. For it to be useful, a system had to be intelligent enough to accommodate and learn from new knowledge and add it to the repository on a real-time basis. The lessons learnt from the evaluation study have significant implications for practice. It shows that supporting the SRL behaviour of professionals can have positive implications for fostering their SRL behaviour. It also indicates that technological support can help them become more reflective and strategic in managing their uncertainty.

### 7.3 Methodological Contributions

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Apart from contributions to theoretical knowledge about PEU and SRL and the role of technology in supporting it, this thesis also contributes to the methodological literature.

The first methodological contribution was the use of high-fidelity and low-fidelity prototypes on different platforms for comparing the perceived ease of use and perceived usefulness of the technology intervention. Previous research on TAM has sought to examine the intent to use technology based on how useful one perceives a technology tool to be and how easy they perceive its use to be. However, it has not been used for drawing comparison between prototypes implemented on different digital platforms. Study 3 employed iterative co-design approach embedded in the DBR methodology in which two prototypes were developed on different platforms and TAM framework was used to compare and contrast the efficacy of the features of two prototypes.

The second methodological contribution was the creation of the ‘Learning in uncertainty’ report in Study 3, during Iteration 2, and using the report as a discussion object during the interviews. Using a discussion object served two purposes – 1) it provided the participants with a tangible output from the research participation; 2) it was useful to validate the conceptual LiU framework, as it enabled the researcher to unpack the participants’ perceptions regarding the framework as well as the technology support. In qualitative research, the measures taken for enhancing rigour are indicators of methodological strength of a study. Credibility is an important criterion for determining rigour. Multiple methods are proposed by researchers to enhance the creditability of qualitative research. Some of these are – informant feedback (Onwuegbuzie & Leech, 2007), sharing transcripts with participants (member check) (Goldblatt et al., 2011), and respondent validation (Torrance, 2012). However, there are a number of ethical and methodological challenges associated with them (Goldblatt et al., 2011). Torrance (2012) urge mixed method researchers to, “engage with the views and perspectives of research participants to represent these (participants’) perspectives as fully and validly as possible” (p.115). Using the LiU report as a way of striking reflective dialogue with the participants is a unique methodological contribution to the respondent validation literature.

#### **7.4 Limitations and Directions for future research**

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The research in this dissertation used a rigorous mixed-methods approach to examine the learning in uncertainty phenomenon from multiple perspectives. However, as with all research, it is not without its limitations. First, it is acknowledged that all the methods used in the three studies are self-report measures. Thus, they are subject to selection bias. Moreover, the research sample was limited to CISI professionals. Hence the generalisability of the findings would be strengthened by replication with a different population. Even though CISI is a multi-national institute, all the participants in the present study were from a single geographic location. However, this limitation also provides avenues for future research. There are advantages to conducting a study in one context and

then replicating it in others to test if the findings are applicable. Replication in other cultural and geographical contexts would allow similarities and differences to be identified with respect to the findings from this research. Also, future studies could employ a larger sample size to identify different clusters of professionals who might use certain learning strategies in certain types of perceived uncertainty using a cluster analysis technique (Priem et al., 2002). Using learning analytics techniques to measure professional learning activities in the context of uncertainty could be another potential solution to address this limitation (Berendt et al., 2014; Littlejohn & Margaryan, 2013a).

Secondly, in Study 1, qualitative interviews ( $n = 9$ , which were split into two groups – 5 experts and 4 practitioners) were used to capture detailed descriptions of uncertainty situations encountered by professionals and the associated perceptions and learning strategies used. This method relied on the participants' ability to recall the uncertainty incidents that happened in the past with clarity, thus introducing recall bias or responder bias into the data. Future research could be carried out during or just after uncertainty inducing environmental conditions to capture real-time uncertainty perception and SRL strategies employed.

Thirdly, Study 2 used the vignette technique as a tangible trigger to induce the perception of uncertainty by asking participants to answer the survey questions based on the vignettes presented to them. The vignettes were developed from detailed descriptions of uncertainty examples provided by the participants in Study 1 and validated for its clarity, reliability, and validity with the finance professionals (Jacob & Mulder, 2019). However, there was an inherent limitation in assuming that the hypothetical situations were a good match to the real-life situations encountered by professionals. Every effort was made to minimise this limitation by validating the vignettes with the finance professionals before using them in the survey. However, it is acknowledged that there are other sophisticated statistical methods for determining the relevancy of the vignettes to real-life situations. For example, McKelvie et al. (2011) used hypothetical scenarios in their research examining the relationship between the type of PEU and entrepreneurial action. They found no significant differences between participants' responses to hypothetical scenarios and what they did in real life. A similar comparison could not be undertaken in this study.

The fourth limitation related to the vignette technique was that the participants were asked to choose from a list of vignettes whichever one was most relevant for them. Hence, it was not possible to measure if the same uncertainty is perceived differently by participants based on their personality characteristics such as uncertainty avoidance tendencies (Yoo et al., 2011), or tolerance to ambiguity (McLain, 1993). The PEU literature could benefit from further research on individual traits and factors in relation to the perception of uncertainty.

Fifth limitation stems from employing the SDA method in Study 2. Ruggiano and Perry (2019) assert that due to the inherently subjective nature of qualitative research, using interview data collected by someone else might lead to interpretation bias or misinterpretation of data due to



researcher not being completely well-versed with the data collection instrument. This limitation was slightly mitigated as the researcher had an in-depth knowledge of the concepts and questions included in the interviews as they were based on the SRLWQ instrument which was also used by the researcher in their survey. Yet, knowledge of the data collection instrument does not compensate for the researcher's presence and active involvement in the data collection process. Since researcher plays a vital role in understanding, interpreting, and participating in the interview process, not 'being there' limits researcher engagement with the data, as non-verbal cues and contextual information in which certain responses are elicited can be lost in secondary data (Tarrant & Hughes, 2020).

Sixth, this research is based on a cross-sectional view of participants' work life with self-report data. This gave an in-depth insight into the complex processes of uncertainty perception and learning undertaken when perceiving uncertainty. However, there is value in further exploring the findings of this study longitudinally. Longitudinal studies unpacking the relationship between SRL and PEU, could give further insights into the longevity of the learning strategies and exactly when they are deployed in the uncertainty perception process. Hence in future work, a trace-based analytic technique could be employed once the technology support is fully developed and implemented. Siadaty et al. (2016) employed trace-based measures along with self-report data for measuring perceived usefulness of technological scaffolding for micro-level SRL processes. However, they found that the trace data did not align with the self-report data. This means that even though users indicated the technology intervention to be useful in the self-report data, they did not put it to actual use in practice. Thus, future research using trace-based analytics is warranted to evaluate how the perceived usefulness for technology supported SRL reported in this study translates to real-world usefulness of technology in practice.

The significance of networking and help-seeking points towards the importance of building social connections for learning in uncertainty. This study used SRL perspective for conceptualising the learning processes in uncertainty. Future research could benefit from using social network analysis for identifying the centrality (whom do people speak to in an organisation in uncertainty), structural holes (absence of connection that could explain the lack of information leading to uncertainty), and bridges (people who bridge the information gap between two standalone clusters) of social connections in uncertainty contexts (Murphy et al., 2020).

## **7.5 Implications for Professional Practice**

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The research in this dissertation has six key implications both for finance professionals and for organisations who are responsible for providing continuous professional development platforms for finance professionals.

Increased awareness of not just the source of uncertainty (Downey & Slocum, 1975; Priem et al., 2002) but also the type of perceived uncertainty (Milliken, 1987), may help them professionals in planning their learning and to set learning goals accordingly. The findings from this research indicate that the type of PEU determines the learning strategies adopted by professionals. While there are certain strategies like networking or reflection which were employed for learning in uncertain times irrespective of the type of PEU, the analysis from this research shows that becoming aware of one's uncertainty perception may aid in strategising learning plans. Previous research has shown that professionals find it difficult to identify and set learning goals (Littlejohn et al., 2016). Using the LiU framework to identify the type of perceived uncertainty and SRL profile could provide a starting point for identifying one's learning goals.

Using the LiU framework to create their LiU profile could help professionals identify gaps in their SRL behaviour, which, when addressed, could help them take control of their learning in times of uncertainty. Since uncertainty is an inherent component of finance professionals' workplace environment, knowing how to learn better in uncertainty could help them enhance their performance and productivity in the face of uncertainty. For example, a professional who sees that they score low in help-seeking behaviour in the SRL profile while facing state uncertainty, they may feel motivated to reach out to colleagues and experts in the field, thus helping them reduce their perception of uncertainty. Moreover, increased awareness of one's SRL profile could help professionals prioritise their time and resources to manage micro-level sources of uncertainty (ones that are not related to the organisation or macro-economic level).

The evidence from this research indicates that critical reflection of one's learning behaviour in uncertainty is crucial for enhancing professionals' agency in learning. Previous research on uncertainty management has mostly sought to either 'cope' with uncertainty (Alpers, 2019) or to reduce it completely (Cyert and March 1963). Within the finance sector, where professionals constantly operate in an environment of radical uncertainty (Chong and Tuckett, 2015), enhancing their competency in learning to learn in uncertainty is extremely essential.

An important implication for organisations is to exercise transparency and clearly communicate information related to uncertainty in order to reduce the perception of state uncertainty for their employees. The findings from this research suggest that the main antecedents to uncertainty are lack of knowledge, lack of communication, lack of trust, role of technology, market uncertainty, and disconnect with the academic world. Organisations play an important role in providing the necessary information and address the knowledge gaps about market trends, regulatory changes, and training requirements in order to address the lack of communication and lack of trust. They also play an important role in bridging the gap between research and practice, thus ensuring that the latest research within the sector is being disseminated to the practitioners. This will aid in reducing the state uncertainty perception of professionals. The findings from this research suggest that there are no

specific learning strategies employed by professionals in state uncertainty. In fact, during the Study 1 interviews, the negative perceptions regarding uncertainty mostly related to the perception of state uncertainty. Hence by being transparent and openly communicating information about the environmental uncertainties, organisations can help professionals reduce the perception of state uncertainty.

Another implication for organisations is to encourage and scaffold professionals' perception of effect and response uncertainty by providing avenues for forming and maintaining network connections and encourage sharing of best practices in the form of lunch-time workshops, think tanks, and webinars. The findings from this research suggest that perception of effect and response uncertainty has significant implications for professionals' SRL behaviour. Milliken's (1987) research suggest that effect uncertainty and response uncertainty arise when the perception of state uncertainty reduces. This means that once professionals have enough information that reduces their perception of state and certainty, they start perceiving effect or response uncertainty. Since the findings from this research show that professionals display increased value for learning activities and show increased levels of goal setting and strategic planning of their learning activities, scaffolding their perceptions of effect or response uncertainty might be conducive for fostering a learning culture within the organisation. This is in alignment with findings from previous research (Michel & Wortham, 2009; Sund, 2015). For example, in their comparative longitudinal research on two banks and their learning culture, Michel and Wortham (2009) found that the professionals working in the bank that deliberately put them in uncertainty inducing situations developed learning mechanisms to manage uncertainty, and performed better in times of actual environmental uncertainty. Thus, there is value in organisations scaffolding and fostering perceptions of effect and response uncertainty in their employees.

Building on the previous point, it is essential for organisations to ensure sufficient reflection opportunities for individuals and teams. Findings from this thesis suggest the importance of reflection in learning during uncertainty. Organisations must provide time and support for reflective activities to be incorporated within their daily work activities. This is in-line with previous research which indicates that "to stay motivated to reflect on learning, people need to be informed about the usefulness of metacognitive activities and obtain autonomy to design individual learning trajectories" (van Loon, 2019, p.13). A potential solution for motivating the professionals and supporting their self-reflection activities, the technology tool proposed in this research could be integrated into organisational CPD framework as a reflective tool.

This relates to the implication for organisations to adopt built-in technology support for SRL strategies in organisational learning management systems with a feedback mechanism to keep strategies updated. Results from the technology evaluation study suggest that although professionals have a positive perception towards the use of technology for strategising their learning activities, there

is a caveat that it has to be integrated with organisational goals and objectives and should lead to tangible competency reports that they can use while negotiating the yearly appraisals with their managers. This implication echoes Siadat et al.'s. (2011) finding that emphasises the importance of the synchronicity between organisational and individual goals and expectations in order for the technology-enabled learner developmental activities to benefit the organisation's performance.

## **7.6 Concluding Remarks**

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Research suggests that uncertainty is inherent in the finance sector for the foreseeable future (Baker et al., 2020; McKibbin & Fernando, 2020; Zhang et al., 2020). From managing workforce well-being to ensuring business continuity, learning in the face of uncertainty is a priority for financial organisations in order to survive and thrive in uncertain times. In the context of stock market volatility, Baker et al. (2020) note that, “backward-looking statistical analyses and historic data are unlikely to yield suitable measures of forward-looking uncertainty” (p. 2). Hence, both organisations and professionals are looking towards novel ways of learning and building a repertoire of best practices in the new normal characterised by uncertainty.

Given the pivotal role of uncertainty in the modern-day workplace, there is surprisingly little known about how professionals learn in uncertainty. The research in this thesis made theoretical and methodological contributions to further what is known about learning in uncertainty and ways in which it can be supported using technology. It also unpacked the relationship between PEU and SRL strategies. In doing so, it provided deeper insights into professionals’ learning mechanism in relation to perceived uncertainty and laid the foundation for future research to unpack further the nuances of uncertainty perception and contextual factors that foster learning. This research also has implications for professionals and organisations, as it provides evidence for the role of technology in supporting SRL behaviour and expectations of professionals from such a technological scaffold.

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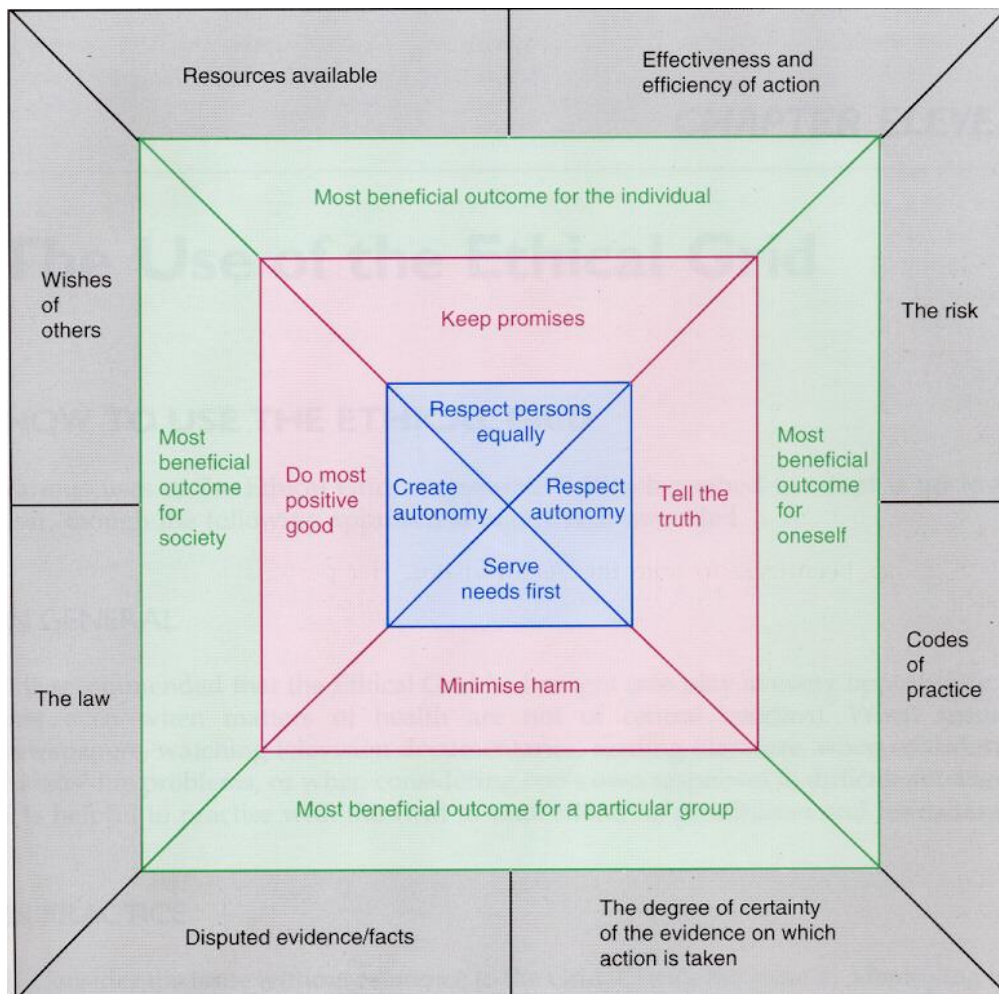
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## Appendix 1 – Seedhouse's (1998) ethical grid



## Appendix 2 – HREC Form

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### Human Research Ethics Committee (HREC)

From Dr Louise Westmarland  
The Open University Human Research Ethics Committee  
Email [louise.westmarland@open.ac.uk](mailto:louise.westmarland@open.ac.uk)  
Extension (6) 52462  
To Vasudha Chaudhari  
Project title Learning in uncertain times  
HREC ref HREC/2017/2506-Chaudhari  
AMS ref



### Memorandum

Date application submitted: 24/02/2017  
Date of HREC response: 29/03/2017

This memorandum is to confirm that the research protocol the above-named research project, as submitted to the OU HREC for ethics review, has been given a favourable opinion by Chair's action.

Please note the following:

1. You are responsible for notifying the HREC immediately of any information received by you, or of which you become aware which would cast doubt on, or alter, any information contained in the original application, or a later amendment which would raise questions about the safety and/or continued conduct of the research.
2. It is essential that any proposed amendments to the research are sent to the HREC for review, so they can be recorded and a favourable opinion given prior to any changes being implemented (except only in cases of emergency when the welfare of the participant or researcher is or may be effected).
3. Please include your HREC reference number in any documents or correspondence, also any publicity seeking participants or advertising your research, so it is clear that it has been reviewed by HREC and adheres to OU ethics review processes.
4. You are authorised to present this memorandum to outside bodies such as NHS Research Ethics Committees in support of any application for future research clearance. Also, where there is an external ethics review, a copy of the application and outcome should be sent to the HREC.
5. OU research ethics review procedures are fully compliant with the majority of grant awarding bodies and where they exist, their frameworks for research ethics.
6. At the conclusion of your project, by the date you have stated in your application, you are required to provide the Committee with a final report to reflect how the project has progressed, and importantly whether any ethics issues arose and how they were dealt with. A copy of the final report template can be found on the research ethics website - [http://www.open.ac.uk/research/ethics/human-research/human-research-ethics-full-review-process-and-proforma#final\\_report](http://www.open.ac.uk/research/ethics/human-research/human-research-ethics-full-review-process-and-proforma#final_report)

Best regards

Dr Louise Westmarland  
The Open University Human Research Ethics Committee

[www.open.ac.uk/research/ethics/](http://www.open.ac.uk/research/ethics/)

January 2017

### Appendix 3 – Consent Form (used in Study 1 and Study 3)

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Dear Participant,

The research you have been asked to be involved is titled 'Learning in Uncertainty'. The purpose of this study is to investigate how finance professionals self-regulate their learning in periods of uncertainty. The research is carried out by Vasudha Chaudhari, a Leverhulme funded PhD student at the Institute of Educational Technology, Open University, Milton Keynes.

Researcher's contact details are Vasudha Chaudhari, IET, Open University, Walton Hall, Kents Hill, Milton Keynes MK7 6AA.

Before we begin the interview please read the following information and sign below to provide your consent for participating in this study:

- I confirm that I have read the participant information sheet and understand the purpose of this research.
- I understand that I can ask questions about the study and have the right to obtain satisfactory answers to questions, and any additional details requested.
- I give permission for the data collected to be used in an anonymous form in any written reports, presentations and published papers relating to this study. My written consent will be sought separately before any identifiable data is used in such dissemination.
- The request to withdraw and/or to destruct any data gathered from me, can be sent to the principal investigator of this study at Vasudha.chaudhari@open.ac.uk , who will take all the necessary steps to guarantee the follow up of the request to be taken out of this research at any stage.
- I understand that this project has been reviewed by and received ethics clearance through the Open University's Human Research Ethics Committee.
- I understand the arrangements with regards to data access (who will have access to my data), data storage (where the data will be stored and privacy measures), and data handling (what will happen to the data at the end of the project).
- I understand how to raise any concerns or lodge a complaint if required.

I, (print name in full) ..... am over 18 years of age and agree to participate in this research conducted by Vasudha Chaudhari, Open University, as part of her PhD.

Signature.....

Date.....



## **Appendix 4 – Study 1 – Participant Information Sheet**

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Dear Participant,

My name is Vasudha Chaudhari and I am undertaking this project as part of my Leverhulme funded PhD at the Open University, UK. This research deals with understanding how finance professionals self-regulate their learning in times of uncertainty. I would like to invite you to take part in this research as you are regarded as an experienced professional from the financial sector.

The purpose of this study is to understand the strategies employed by finance professionals to deal with periods of uncertainty. The results of this study will show the different types of uncertainties faced by professionals from the financial sector and illuminate the methods that professionals undertake to lessen the impact of the perceived uncertainty.

I can assure you that all the data collected in this project will be stored in a NAS server, which is secured by high-end optimised data protection protocols. Since I possess solitary access to the data storage system (NAS server), I accept complete responsibility to ensure its integrity and security. The data will be accessible only to me and my supervisor – Professor Allison Littlejohn. On completion of the research project, all data will be safely disposed. All your contributions to the research (e.g. in the forms of quotes) will be anonymised in any write up of the research.

The Open University is committed to the dissemination of its research for the benefit of society and the economy and, in support of this commitment, has established an online archive of research materials. This archive includes digital copies of student theses successfully submitted as part our PhD programme. Holding the archive online gives easy access for researchers to the full text of freely available theses, thereby increasing the likely impact and use of that research. This research will be written up in the form of a PhD thesis. On successful submission of the thesis, it will be deposited both in print and online in the University archives, to facilitate its use in future research. The thesis will be published with restricted access. However, the data collected from you during the research will completely anonymised and free from any personally identifiable information.

This project has been reviewed by and received ethics clearance through the Open University's Human Research Ethics Committee. Please note that you have the right to obtain satisfactory response to any questions you may have about the study before you decide whether to participate. You may withdraw from the study without penalty at any time by advising me of this decision. If you have any concerns about any aspect of this project, please let me know and I will try my best to answer your query. If you remain unhappy and wish to make a formal complaint, please contact the Human Resources Ethics Committee ([Research-REC-Review@open.ac.uk](mailto:Research-REC-Review@open.ac.uk)).

If you have any further questions about the research before deciding to take part in the study, please do not hesitate to contact me or my supervisor.

My contact details are: Vasudha Chaudhari ([vasudha.chaudhari@open.ac.uk](mailto:vasudha.chaudhari@open.ac.uk))

Institute of Educational Technology, The Open University, Walton Hall, Milton Keynes MK7 6AA, UK.

I sincerely thank you for your participation and hope that this research will be mutually beneficial and insightful.

Thanks,

Vasudha Chaudhari

## Appendix 5 –Operationalising Milliken’s definition of uncertainty into interview schedule

Definitions of Types of Uncertainties operationalised within the interview schedule

**State Uncertainty:** State uncertainty is defined as the situation that occurs when managers do not feel confident that they understand what the major events or trends in an environment are or feel unable to accurately assign probabilities to the likelihood that events or changes will occur.

**S(H/L)** – Exemplifies a (high/low) state uncertainty situation

**S(H/L) a** – Characterises a (high/low) state uncertainty situation, with questions about how managers/practitioners were unable to accurately assign probabilities to the likelihood that events or changes will occur

**S(H/L) b** – Will give us outcomes of (high/low) state uncertainty situations that can be used in the vignettes

**Effect Uncertainty:** Effect uncertainty refers to the inability to predict the nature of the effect of a future state of the environment on the organisation (understanding of cause-effect relationships)

**E(H/L)** – Exemplifies a (high/low) effect uncertainty situation

**E(H/L) a** – Characterises a (high/low) effect uncertainty situation where we ask questions about the inability of practitioners to predict the nature of the effect of a future state of the environment

**E(H/L) b** – Strategies used by professionals to address the inability to predict the nature of future state of the environment

**E(H/L) c** – Outcomes of the strategies used by professionals to address the inability to predict the nature of future state of the environment

**Response Uncertainty:** Response uncertainty characterises an inability to predict the likely consequences of a response choice

**R(H/L)** – Exemplifies a (high/low) response uncertainty situation

**R(H/L) b** – Characterises a (high/low) response uncertainty situation where we ask about the nature of the situation when professionals felt unable to predict the consequence of their response choice

**R(H/L) c** – Strategies employed by professionals to circumvent the inability to predict the consequence of their response choice

**R(H/L) d** – Outcomes of the strategies used by professionals to address their inability to predict the consequence of their response choice

Explanation of Question Codes

State Uncertainty	Effect Uncertainty	Response Uncertainty
<b>High Uncertainty</b>		

<b>SH</b> – Example of high state uncertainty	<b>EH</b> – Example of high effect uncertainty	<b>RH</b> – Example of high response uncertainty
<b>Sha</b> – Characteristics of high state uncertainty situation	<b>Eha</b> – Characteristics of high effect uncertainty situation	<b>Rha</b> – Characteristics of high response uncertainty situation
<b>SHb</b> – Typical outcomes in a high state uncertainty situation	<b>Ehb</b> – Strategies employed by professionals in high effect uncertainty situations	<b>RHb</b> – Likely consequences of highly unpredictable situation.
	<b>Ehc</b> – Outcomes of the strategies used by people to circumvent highly uncertain situations	<b>RHc</b> – Strategies employed by professionals in highly response uncertainty situation
		<b>RHd</b> – Outcomes of the strategies used by people to circumvent high response uncertainty
<b>Low Uncertainty</b>		
<b>SL</b> – Example of low state uncertainty	<b>EL</b> – Example of low effect uncertainty	<b>RL</b> – Example of low response uncertainty
<b>Sla</b> – Characteristics of low state uncertainty situation	<b>Ela</b> – Characteristics of low effect uncertainty situation	<b>Rla</b> – Characteristics of low response uncertainty situation
<b>SLb</b> – Typical outcomes in a low state uncertainty situation	<b>Elb</b> – Strategies employed by professionals in low effect uncertainty situations	<b>RLb</b> – Likely consequences of predictable situation
	<b>Elc</b> – Outcomes of the strategies used by people to circumvent low effect uncertainty situations	<b>RLc</b> – Strategies employed by professionals in low response uncertainty situation
		<b>RLd</b> – Outcomes of strategies used by people to circumvent low response uncertainty

### Opening

1. Introduce and establish rapport.
2. Explain the research background.
  - a. Examining how people in the FSI deal with uncertainty associated with Brexit
  - b. Examining whether uncertainty fosters/ inhibits learning in the FSI
3. Explain the rationale behind interviewee selection.
4. Mention the time allocated for the call / interview.
5. Explain data integrity and privacy policy.
6. Seek permission to record the conversation.

### Brief Introduction

7. What is your job title?
8. Within the finance industry, which of the sub-domains do you have your focus on?
9. For how long have you been working in this profession?
10. Could you please summarise your career path that got you to your present position?
11. How would you best describe your typical workday?

### State Uncertainty (incomplete information)

12. Can you think of an environmental change that the *<insert sector name>* sector did not expect to deal with? (SH1)
  - a. What were the specific characteristics of that unpredictable environmental change? (SHa)
  - b. What were the outcomes of that environmental change? (SHb)
13. Can you describe a situation when it was difficult for you to determine what the *<insert sector name>* sector's external environment will be like in 1 year ahead? (SH2)
  - a. What were the specific characteristics of that unpredictable environmental change? (SH2a)
  - b. What were the outcomes of that environmental change? (SH2b)
14. Alternatively, can you think of an environmental change that was highly predictable and influenced the *<insert sector name>* sector in any way? (SL1)
  - a. What were the specific characteristics of that predictable environmental change? (SL1a)
  - b. What were the outcomes? (SL1b)
15. Can you also think of a situation of an environmental change, which was expected by the practitioners? (SL2)
  - a. What were the specific characteristics of that predictable environmental change? (SL2a)
  - b. What were the outcomes? (SL2b)

### Effect Uncertainty (inadequate understanding of ambiguous information)

16. Can you give an example when you experienced that professionals of the *<insert sector name>* sector did not know beforehand if their response to an environmental change would have a positive effect on their work? **(EH)**
- What are specific characteristics of those affects? **(EHa)**
  - What did people do in this situation? / How did they react? **(EHb)**
  - What were the outcomes? **(EHc)**
17. Can you give an example when those professionals knew beforehand exactly that their response to an environmental change would have a positive effect on their work? **(EL)**
- What are specific characteristics of those affects? **(ELa)**
  - What did people do in this situation? Can you describe their reactions? **(ELb)**
  - What were the outcomes? **(ELc)**

### **Response Uncertainty (undifferentiated alternatives)**

18. Can you describe a situation in that sector when it was difficult for professionals to determine what alternatives are available at work for responding to environmental changes? **(RH1)**
- What were the specific characteristics of that situation? **(RH1a)**
  - What are the likely consequences of unpredictable environmental changes that affect the work of professionals in that sector? **(RH1b)**
  - What did people do in this situation? **(RH1c)**
  - What were the outcomes? **(RH1d)**
19. Can you describe a situation when the work environment of that sector changed, and professionals were uncertain which of their possible responses would produce desirable outcomes? **(RH2)**
- What were the specific characteristics of that situation? **(RH2a)**
  - What are the likely consequences of unpredictable environmental changes that affect their work? **(RH2b)**
  - What did you do in this situation? **(RH2c)**
  - What were the outcomes? **(RH2d)**
20. Imagine a situation in your sector when practitioners did experience ambiguity regarding the consequences of their response choice to a predictable environmental change. **(RL1)**
- What are the specific characteristics of that situation? **(RL1a)**
  - What are the likely consequences of predictable environmental changes that affect the work of finance professionals in that sector? **(RL1b)**
  - What did people do in this situation? **(RL1c)**
  - What were the outcomes? **(RL1d)**
21. Can you describe a situation when the work environment of that sector changed, and professionals were sure which of their possible responses would produce desirable outcomes? **(RH2)**
- What were the specific characteristics of that situation? **(RH2a)**

- b. What are the likely consequences of unpredictable environmental changes that affect their work? **(RH2b)**
- c. What did you do in this situation? **(RH2c)**
- d. What were the outcomes? **(RH2d)**

### **Closing Comments/questions**

- 22.** Is there anything else that you would like to add to this discussion?
- 23.** Do you have any questions or suggestions for us with regards to our conversation?
- 24.** As a last step of our interview we would like to ask you whether it is possible for you to fill out a short survey to collect some background information.
- 25.** Closing Remarks:

We will collate the information gathered during these interviews, and use them in development of generalised scenarios depicting the types of uncertainties faced by financial professionals. We are happy to share with you the summarised results of this phase of the research. If this conversation has intrigued you even further, and you would like to know more, would you be happy if we contacted you again for validating those scenarios? Thank you so much for your time and your candid participation in this research!

### **Opening**

1. Introduce and establish rapport.
2. Explain the research background.
  - a. Examining how people in the FSI deal with uncertainty associated with Brexit
  - b. Examining whether uncertainty fosters/ inhibits learning in the FSI
3. Explain the rationale behind interviewee selection.
4. Mention the time allocated for the call / interview.
5. Explain data integrity and privacy policy.
6. Seek permission to record the conversation.

### **Brief Introduction**

7. What is your job title?
8. Within the finance industry, which of the sub-domains do you work within?
9. For how long have you been working in this sector?
10. Could you please summarise your career path that got you to your present position?
11. How would you best describe your typical workday?

### **Effect Uncertainty (inadequate understanding of ambiguous information)**

12. Can you give an example when you beforehand did not know if your responds to an environmental change would have a positive effect on your work? **(EH)**
  - a. What are specific characteristics of those affects? **(EHa)**
  - b. What did you do in this situation? **(EHb)**
  - c. What were the outcomes? **(EHc)**
13. Can you give an example when you beforehand knew exactly that your responds to an environmental change would have a positive effect on your work? **(EL)**
  - a. What are specific characteristics of those affects? **(ELa)**
  - b. What did you do in this situation? **(ELb)**
  - c. What were the outcomes? **(ELc)**

### **Response Uncertainty (undifferentiated alternatives)**

14. Can you describe a situation in your sector when you perceived it as very difficult to determine what alternatives are available to you for responding to environmental changes? **(RH1)**
  - a. What were the specific characteristics of that situation? **(RH1a)**
  - b. What are the likely consequences of unpredictable environmental changes that affect your work? **(RH1b)**
  - c. What did you do in this situation? **(RH1c)**
  - d. What were the outcomes? **(RH1d)**



15. Can you describe a situation when your work's environment changed, and you were uncertain which of your possible responses would produce desirable outcomes? **(RH2)**
  - a. What were the specific characteristics of that situation? **(RH2a)**
  - b. What are the likely consequences of unpredictable environmental changes that affect your work? **(RH2b)**
  - c. What did you do in this situation? **(RH2c)**
  - d. What were the outcomes? **(RH2d)**
16. Can you describe a situation at work when you perceived it was easy to determine what alternatives at work are available to you for responding to environmental changes **(RL1)**?
  - a. What are the specific characteristics of that situation? **(RL1a)**
  - b. What are the likely consequences of predictable environmental changes that affect the <insert sector name> sector? **(RL1b)**
  - c. What did you do in this situation? **(RL1c)**
  - d. What were the outcomes? **(RL1d)**
17. Can you describe a situation when your work's environment changed, and you were sure about what your possible responses would produce desirable outcomes? **(RL2)**
  - a. What are the specific characteristics of that situation? **(RL2a)**
  - b. What are the likely consequences of predictable environmental changes that affect your work? **(RL2b)**
  - c. What did you do in this situation? **(RL2c)**
  - d. What were the outcomes? **(RL2d)**

#### **State Uncertainty (incomplete information)**

18. Can you think of an environmental change that you did not expect to deal with in the <insert sector name> sector? **(SH1)**
  - a. Can you identify significant characteristics of that unpredictable environmental change? **(SH1a)**
  - b. What were the outcomes of that environmental change? **(SH1b)**
19. Can you describe a situation when it was difficult for you to determine what the <insert sector name> sector's external environment will be like in 1 year ahead? **(SH2)**
  - a. Can you identify significant characteristics of that unpredictable environmental change? **(SH2a)**
  - b. What were the outcomes of that environmental change? **(SH2b)**
20. Alternatively, can you think of an environmental change that was highly predictable and influenced the <insert sector name> sector in any way? **(SL1)**
  - a. What were the specific characteristics of that predictable environmental change? **(SL1a)**
  - b. What were the outcomes? **(SL1b)**

21. Can you describe a situation when it was easy for you to determine what the <insert sector name> sector's external environment will be like in 1 year ahead? (SL2)
- a. What were the specific characteristics of that predictable environmental change? (SL2a)
  - b. What were the outcomes? (SL2b)

### **Closing Comments/questions**

22. Is there anything else that you would like to add to this discussion?
23. Do you have any questions or suggestions for us with regards to our conversation?
24. Would you be happy to participate in a follow-up interview, where we would like to understand more about how you self-regulated your learning during the times of uncertainty discussed today?
25. As a last step of our interview we would like to ask you whether it is possible for you to fill out a short survey to collect some background information
26. Closing Remarks:

We will collate the information gathered during these interviews and use them in development of generalised scenarios depicting the types of uncertainties faced by financial professionals. We are happy to share with you the summarised results of this phase of the research. If this conversation has intrigued you even further, and you would like to know more, would you be happy if we contacted you again for validating those scenarios? Thank you so much for your time and your candid participation in this research!

**Subject line: Working in Uncertainty, your experience matters!**



Dear Finance Professionals,

In cooperation with the **Chartered Institute for Securities and Investments (CISI)**, we are happy to invite you to participate in our online survey. It will not take more than 15 minutes.

Facing Brexit and assuming 482,000 fewer jobs and £46.8 billion less investment by 2030, we want to understand how finance professionals work in the finance sector.

Formal training is not sufficient to help finance professionals find solutions in unknown situations. CISI provides a host of opportunities to support the highest standard of professionalism.

Together with CISI we want to improve the resources offered to and tailored for financial professionals to ensure they can maintain a high standard of knowledge, excel in their role and do the best job for their firm.

**Therefore, we require your carefully reasoned evaluation! It would be most useful if you could please complete this survey by the 25<sup>th</sup> June 2018.**

< Insert survey link here >

Thank you very much for your candid participation in this research project. Please feel free to contact us for further questions or remarks.

Kind Regards

The Chartered Institute for Securities and Investments (CISI), Open University (UK) and University of Regensburg (Germany).



Thank you for volunteering to participate in this survey!

**About the research:**

The purpose of this survey is to examine how professionals in the finance sector deal with uncertainty at work. Insights from this research will be used to develop a training intervention for professional development. Partnering with the Chartered Institute for Securities and Investments (CISI), this study is carried out as a collaborative research project between The Open University (UK) and The University of Regensburg (Germany).

**Data Protection and Privacy:**

This project has been reviewed by and received ethics clearance through the Open University's Human Research Ethics Committee. This survey does not attempt to make any inferences on an individual level. We guarantee that all the data will be anonymised as per the Data Protection Act, and will be stored securely in institutional repositories, which only the principal investigators can access. All information will be used for research purposes only and will not be given to any third parties.

**Contacts and Questions:**

For further information about this research, or about the survey, please contact the principal investigators of this research project: [Vasudha.Chaudhari@open.ac.uk](mailto:Vasudha.Chaudhari@open.ac.uk) OR [Leonie.Jacob@ur.de](mailto:Leonie.Jacob@ur.de)

This survey will take no more than **15 minutes** of your time to complete.

There are no correct or incorrect responses to the questions. Please indicate how you would naturally behave, rather than how you think you should behave!

**Which of the following scenarios is most likely to induce uncertainty within your current work context?**

- ☐ Loss of passporting after Brexit
- ☐ FinTech and competition in the finance sector
- ☐ Currency Movements
- ☐ Significant increase in demand for socially and ecologically responsible investments

**Instructions to complete the survey:**

- Please read the description of the work situation carefully
- Try to imagine this work situation vividly and in detail according to your work experiences
- Please always refer to this particular work situation when you respond to the questions of this survey (the work situation will always be shown at the beginning of each page)

2/7

## LOSS OF PASSPORTING AFTER BREXIT:

Imagine you face the following work situation:

It is not clear what sort of Brexit deal the British Government will be able to negotiate. With a 'hard' Brexit as a likely outcome, all current passporting rights that enable cross-border services (e.g. raising bonds, getting syndicated loans, and hedging loans in respect of several risk factors) might become invalid within the Euro-zone. Your team is assigned the task of developing and implementing a contingency plan for your organisation by the end of May 2018. It remains unclear if the contingency plan includes specific processes, such as downsizing, restructuring, or other relevant strategies and what the consequences of the contingency plan will be in your organisation. Irrespective of the content of the contingency plan, it is clear that it will have implications for your organisation.

Please indicate the extent to which the following statements describe the strategies that you employ during this uncertainty situation:

I...

	5= Very true for me	4	3	2	1 = not at all true for me
...set personal standards for performance in my job	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...set long-term goals (monthly or yearly) in order to direct my learning activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...set goals to help me manage the time I spend on learning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...set realistic deadlines for learning once I have identified a learning need	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...ask myself questions about each learning task before I begin	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...think of several ways to solve a problem and choose the best one	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	5= Very true for me	4	3	2	1 = not at all true for me
...adapt strategies that have worked in the past, when planning my learning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...use specific strategies for different types of things I need to learn	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...believe that I can use what I learn in this job in the future	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...prioritize learning new things on the job	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...can remain calm when facing difficulties in my job because I can rely on my abilities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... can usually find several solutions, when confronted with a problem in my job	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	5= Very true for me	4	3	2	1 = not at all true for me
....can usually handle whatever comes my way in my job	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
....feel prepared for my occupational future because of my past experiences	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
....meet the goals that I set for myself in my job	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
....feel prepared for most of the demands in my job	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
....think that learning undertaken in this job is important to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3/7

## LOSS OF PASSPORTING AFTER BREXIT:

Imagine you face the following work situation:

It is not clear what sort of Brexit deal the British Government will be able to negotiate. With a 'hard' Brexit as a likely outcome, all current passporting rights that enable cross-border services (e.g. raising bonds, getting syndicated loans, and hedging loans in respect of several risk factors) might become invalid within the Euro-zone. Your team is assigned the task of developing and implementing a contingency plan for your organisation by the end of May 2018. It remains unclear if the contingency plan includes specific processes, such as downsizing, restructuring, or other relevant strategies and what the consequences of the contingency plan will be in your organisation. Irrespective of the content of the contingency plan, it is clear that it will have implications for your organisation.

**Please indicate the extent to which the following statements describe the strategies that you employ during this uncertainty situation:**

I...

	5= Very true for me	4	3	2	1 = Not at all true for me
....write down a plan to describe how I hope to achieve my learning goals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
....ask myself how my learning is related to what I already know	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
....change strategies when I don't make progress while learning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
.... make notes (including diagrams, etc.) to help organise my thoughts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
....focus on the meaning and significance of new information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
....organise my time to best accomplish my goals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
....try to relate new knowledge I find to what I already know	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



	5= Very true for me	4	3	2	1 = Not at all true for me
....play around with ideas of my own related to what I am learning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
....prefer tasks that arouse my curiosity, even if I need to learn to achieve them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
.... ask my colleagues for help, when I am unable to understand something	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
....fill in the gaps in my knowledge by getting hold of the appropriate material	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
....bring together information from different sources (for example: people and resources)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
.... try to understand the problem as thoroughly as possible, when faced with a challenge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
.... treat the resources I find as a starting point and try to develop my own ideas from them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	5= Very true for me	4	3	2	1 = Not at all true for me
.... think about possible alternative ways to do my tasks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
.... apply ideas from my previous experience to my job where appropriate	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
.... identify colleagues in my workplace whom I can ask for help if I need it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
....look up something, if I am unsure of it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
....like opportunities to engage in tasks that require me to learn	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## LOSS OF PASSPORTING AFTER BREXIT:

Imagine you face the following work situation:

It is not clear what sort of Brexit deal the British Government will be able to negotiate. With a 'hard' Brexit as a likely outcome, all current passporting rights that enable cross-border services (e.g. raising bonds, getting syndicated loans, and hedging loans in respect of several risk factors) might become invalid within the Euro-zone. Your team is assigned the task of developing and implementing a contingency plan for your organisation by the end of May 2018. It remains unclear if the contingency plan includes specific processes, such as downsizing, restructuring, or other relevant strategies and what the consequences of the contingency plan will be in your organisation. Irrespective of the content of the contingency plan, it is clear that it will have implications for your organisation.

**Please indicate the extent to which the following statements describe the strategies that you employ to prepare yourself for this uncertain situation.**

I...

	5 = Very true for me	4	3	2	1 = Not at all true for me
....know how well I have learned once I finish a learning task	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
....ask myself if there were other ways to learn after I finish a learning task	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
....think about what I've learnt after I finish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
....think about how my learning fits into the 'bigger picture' at my company	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
....consider how my learning relates to my team	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
....try to understand how new information I've learned impacts my work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## LOSS OF PASSPORTING AFTER BREXIT:

Imagine you face the following work situation:

It is not clear what sort of Brexit deal the British Government will be able to negotiate. With a 'hard' Brexit as a likely outcome, all current passporting rights that enable cross-border services (e.g. raising bonds, getting syndicated loans, and hedging loans in respect of several risk factors) might become invalid within the Euro-zone. Your team is assigned the task of developing and implementing a contingency plan for your organisation by the end of May 2018. It remains unclear if the contingency plan includes specific processes, such as downsizing, restructuring, or other relevant strategies and what the consequences of the contingency plan will be in your organisation. Irrespective of the content of the contingency plan, it is clear that it will have implications for your organisation.

In this situation, I am unsure about....	5 = Completely true for me	4	3	2	1 = Never true for me
...what my workplace's environment will be like in 1 year from now	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...how probable the occurrence of that situation is	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...what impact this situation will have on my workplace	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...if my organisation's reaction on that situation will have a positive effect on my workplace	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...what different response options I have	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...if my response to this situation will produce desirable outcomes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What is your Job Title?

Within the finance sector, which of the following subdomains are you currently working in?

- ☐ Wealth Management
- ☐ Retail Banking
- ☐ Compliance and Risk
- ☐ Operations and IT
- ☐ Other

For how long have you been working in this sector

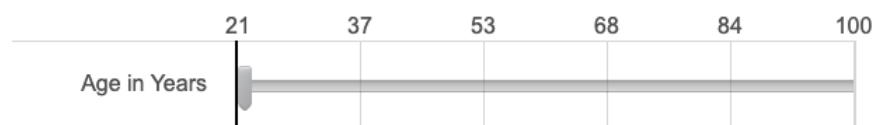


What is the number of employees working in your organisation?

- ☐ 1-4
- ☐ 5-9
- ☐ 10-19
- ☐ 20-49
- ☐ 50-99
- ☐ 100-249
- ☐ 250-499
- ☐ 500-999
- ☐ 1000 or more

In which country do you currently work in?

What is your age?



Gender

- ☐ Female
- ☐ Male
- ☐ Other

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What is your current nationality?

Afghanistan ▼

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When you are facing an uncertainty situation, what sort of training activities would you prefer most?

7/7

**Appendix 10 – Study 2 – Interview schedule used during data collection of the secondary data in primary study (Littlejohn et al., 2016)**

**INTRODUCTION AND BACKGROUND (icebreakers)**

Can you briefly describe your role?	(we will have information from the questionnaire about line management responsibilities etc., but it will also be useful to understand the context they are working within)
Do you undertake annual development planning with your line manager?	Probe to find out what it entails, and whether they think it is useful.

**SRL and Learning Situation**

	<b>QUESTIONS</b>	<b>PROBE</b>
<b>context</b>	<ol style="list-style-type: none"> <li>1. Can you please describe learning situation we have agreed to explore?</li> <li>2. What was the trigger for this learning?</li> </ol>	
<b>Planning/Forethought</b>		
<b>Strategic planning (F2)</b>	<ol style="list-style-type: none"> <li>3. How did you define what you needed to learn (WLB 16)?</li> <li>4. To what extent did you plan – or did you just jump right in? (WLB 18)</li> </ol>	<p>(probe: What motivated you to learn?) (probe resources consume) people (connect)</p> <p>(probe to see if they did any explicit planning, but try not to mention goals) (create and contribute – so check if it was for self- or public)</p>
<b>Goal setting (F3)</b>	<ol style="list-style-type: none"> <li>5. Did you have a specific outcome in mind?</li> </ol>	You are looking for them to describe goals etc.
<b>Occupational self-efficacy (F1)</b>	<ol style="list-style-type: none"> <li>6. Did you feel capable of managing your own learning in this situation?</li> </ol>	
<b>Task interest/value (F4)</b>	<ol style="list-style-type: none"> <li>7. Were you interested in learning or merely in solving the problem?</li> </ol>	
<b>Performance</b>		
<b>‘Strategies’ (P1)</b>	<p>(we are interested in the particular processes involved in learning, but ask ...)</p> <ol style="list-style-type: none"> <li>8. How did you learn?</li> <li>9. What resources did you utilise?</li> <li>10. Did your learning involve the creation of anything – e.g. did you make notes, or a report for yourself</li> <li>11. Would you reuse anything (that they mentioned) again or was it only of value during the learning process itself?</li> <li>12. Did you share anything with anyone else either formally (e.g. reports) or informally (e.g. through informal discussions, postings on knowledge bases etc.)</li> <li>13. We are interested in the role that technology plays in learning in the</li> </ol>	Probe: a mechanical process or enjoying the learning process itself

	workplace. Did you use your phone computer etc (probe for software), or make notes on paper etc.	
<b>Help seeking (P2)</b>	<b>14.</b> Who did you interact with during this learning episode	(What strategies did you enact?) (If not covered) (consume) (probe for evidence of people at different roles, expertise levels, and also whether they are closely related in the company, or distant (e.g. evidence of a broader learning network).
<b>Self-reflection</b>		
<b>Self-evaluation (S2)</b>	<b>15.</b> Did your actions help you address the problem you had encountered? <b>16.</b> Did you talk to anyone else to discuss the value of the learning episode (peers/line manager)? <b>17.</b> Did you make any personal or formal record reflecting on your learning?	(probe to see whether they did any self-evaluation, try to understand to what degree they evaluated against an external goal.). Try to establish whether there is any evidence of cyclical behaviour – did they have to go through iterations? (probe: connect).
<b>Self-satisfaction (S1)</b>	<b>18.</b> Were you satisfied of the overall learning experience?	Probe: in term of what it impacted your job, team, organisation

#### WRAP-UP

Is the learning situation you have described typical of the type of learning you undertake in the workplace?	(capture typical/how this is not typical- e.g approach/motivation, type of problem, type of strategy)
How often do you think you ‘learn’?	(probe with daily, weekly monthly etc.)
Is there anything else you would like to say with regard to your learning in the workplace?	Open ended.

### **What is this research about?**

The Open University, UK has been working with the Chartered Institute for Securities and Investment (CISI) to find out how finance professionals learn on-the-job. Initial findings from this research indicate that finance professionals are working under increasing levels of uncertainty and that the causes of uncertainty frequently change.

We are developing a technological approach to help finance professionals plan what and how to learn and cope during periods of uncertainty.

We are looking for volunteers to give us feedback on the approach.

### **Who is conducting this research?**

The research is being carried out by Vasudha Chaudhari, as part of her PhD. It is fully funded by the Leverhulme Trust in partnership with The Open University. Professor Allison Littlejohn and Dr Simon Cross are also involved in this project as Vasudha's supervisors.

### **Who is this study aimed towards?**

Finance professionals who are:

- Currently working in Retail Banking, Investment Banking, Wealth Management, Compliance or similar domains
- Currently working in Government, NGO or Private sector
- Have less than 10 years working in the finance sector and

### **When and Where?**

- 30 minutes of your time (If you wish, you will be invited for a second round of interview in the next phase of the research).
- In person in the UK or remotely via Skype for business or WebEx

### **What will I do?**

#### **Step 1:**

You will be asked to perform 1 or 2 tasks using the mock-up of the technological approach. Duration: 5 - 10 minutes.

#### **Step 2:**

A short conversation during which you will be asked a few questions about your thoughts and opinions regarding the design, usability, and relevance. Duration: 15-20 minutes.

### **What happens to my data that is collected during this research?**

- Your opinions and feedback data will be processed to enhance the technological approach.
- Any data solicited from these interviews will be used to define an actionable framework for finance professionals to be used during uncertainties.
- All the data will inform the growing body of research on professional learning during times of uncertainty.
- The results from the analysis of the data will be written up as part of a PhD Thesis.

### **What about the privacy of my data?**

This project has been reviewed by and received ethics clearance through the Open University's Human Research Ethics Committee.

I can assure you that all the data collected in this project will be stored in a NAS server, which is secured by high-end optimised data protection protocols. Since I possess solitary access to the data storage system (NAS server), I accept complete responsibility to ensure its integrity and security. The data will be accessible only to my supervisor – Dr. Simon Cross and myself. On completion of the research project, all data will be safely disposed. All your contributions to the research (e.g. in the forms of



quotes) will be anonymised (any personally identifiable information will be redacted) in any write up of the research.

**What happens next, if I wish to participate in this research?**

You can indicate your interest in participating in this research by registering your email-id via the sign-up form and the researcher will contact you soon.

**What happens if I decide to discontinue my participation in this research?**

You may of course withdraw from the study at any time before September 2019, after which the data will be analysed and written up in the thesis

**Who can I contact if I have any further questions?**

We would be delighted to answer any questions you may have about the study before you decide whether to participate. If you have any concerns about any aspect of this project, please contact the principal researcher.

Contact details of the entire team are as follows:

**Principal Researcher**

Vasudha Chaudhari

**[Vasudha.chaudhari@open.ac.uk](mailto:Vasudha.chaudhari@open.ac.uk)**

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Dr Simon Cross

**[Simon.cross@open.ac.uk](mailto:Simon.cross@open.ac.uk)**

**Address:**

Institute of Educational Technology, The Open University, Walton Hall, Milton Keynes MK7 6AA, UK.

### **Opening Questions:**

1. Introduce and establish rapport
2. Explain the research background
3. Explain rationale behind the interviews
4. Explain data integrity and privacy policy
5. Seek permission to record the conversation

### **Prototype feedback questions:**

#### **1) Questions to validate if the goal of the prototype was realised by the users**

1. What did you think the role of the prototype was?
2. When would you use this within your workplace learning?
3. Do you use anything similar to this? If yes, what?
4. Was there anything that did not make sense to you?

#### **2) Questions about usability and design**

1. Did the prototype cover all aspects of your learning strategies?
2. How would you rate the difficulty level of this activity?
3. Did it take you more or less time than you expected to complete this activity?
4. Can you list the functionalities of the prototype (this question was asked to see which functionalities users remembered the most)?
5. What would make this prototype better?
6. How did your experience with prototype 2 compare with that of prototype 1? (for iteration 2 only)

#### **3) General technology usage (These questions were asked to investigate the type of technologies in used by professionals and to understand the attitude of use of technology)**

1. Do you currently use any kind of technology as part of your learning process? If so, how often do you use it?
2. Which technologies do you use for learning? What makes them appealing to you?
3. Do you think that using the <prototype no.> would improve the way you approach learning when you perceive uncertainty at workplace?
4. Do you think that <prototype no.> would enable you to plan your learning more effectively?
5. Overall, do you think that using <prototype no.> would help increase your productivity?
6. Was it easy to navigate through the different sections on <prototype no.>? If not, which sections did you find challenging?
7. Did you think it was rigid and inflexible to interact with?

8. Do you think it will take a lot of time and effort to become skilful at using <prototype no.>?
9. Overall, do you feel that <prototype no.> was easy to use?
10. If this prototype is developed into a full-fledged product, would you use it? If so, how? If not, what are the main reasons why you would not?

#### **4) Feedback on LiU framework (used in Iteration 2 only)**

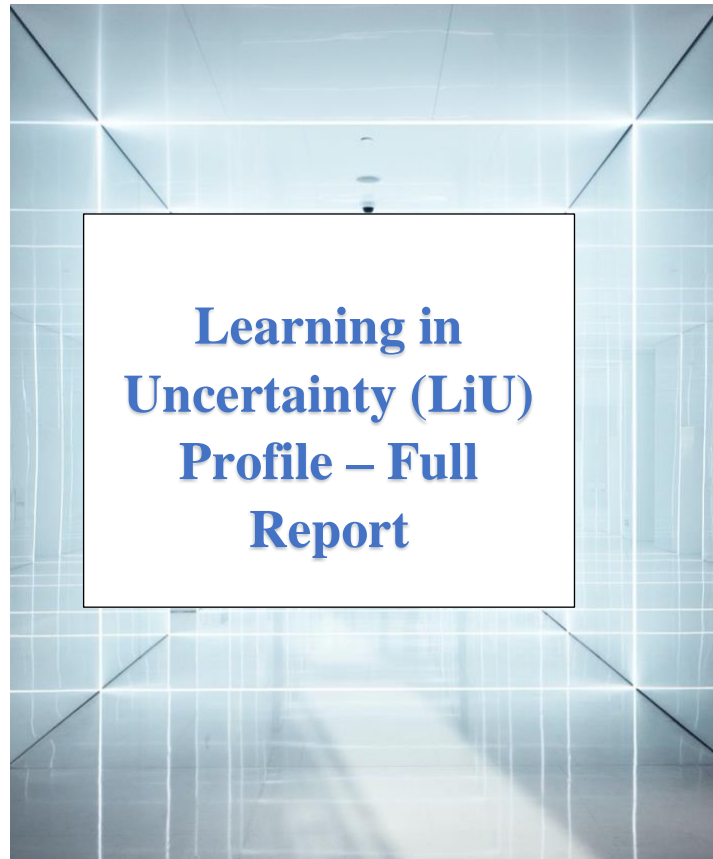
1. Do you think that the suggested SRL strategies are appropriate for you? What were you expecting?
2. Do you think that the type of uncertainty you are facing was correctly identified by the app?
3. What did you think about the SRL profile created based on your responses? Did you find it useful? If so, how?
4. Did you find the report useful? If so, where do you see yourself using it?

#### **5) Learning**

1. What do you typically do when you perceive an uncertainty in the workplace?
2. What role do you think learning has in uncertainty?

#### **6) Closing questions**

1. Would you be willing to participate in the next phase of the study?
2. Is there anyone else you know, who would also be willing to participate in the study?



### **Learning in Uncertainty**

#### **Association between Uncertainty and Professional Learning**

Uncertainty is an inherent component of the modern-day workplace. The constant pressure to keep up with the transformation of skills and competencies is intensified by the concept of 'Hyperinflation of time'. Not only are the demands of modern workplace changing, but they are doing so at an accelerated rate. This introduces a large amount of uncertainty into workplaces and consequently has major implications for professionals and their learning activities. Since uncertainty seems to be a ubiquitous reality going forward, the onus is on the professionals to prepare themselves for capitalising on or managing uncertain times by being a 'self-regulated' learner.

#### **What does it mean to be a Self-Regulated Learner?**

The textbook definition of self-regulated learning is to be 'metacognitively, motivationally, and behaviourally' an active participant of your own learning. Simply put, you will be a self-regulated learner when you 'know what you know' and are motivated to learn what you do not know through various social and cognitive skills.

#### **About the LiU Report**

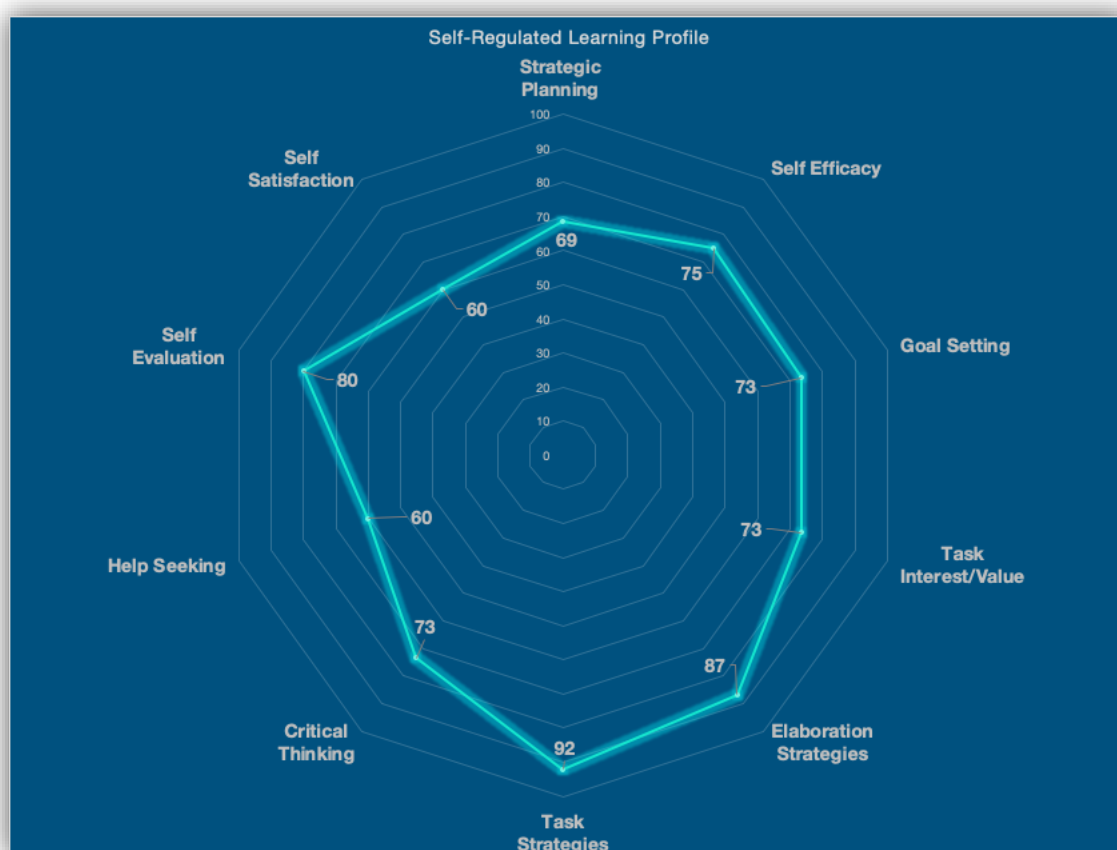
The questions asked in this questionnaire are adapted from a validated survey instrument (SRLWQ), thus are a valid measure of how people learn in uncertainty. Research shows that there are three different types of uncertainties and professionals employ specific learning strategies based on the type of their uncertainty. This report has been generated based on your answers to the LiU questionnaire that analyses your self-regulated learning skills, uncertainty avoidance tendencies, and provides personalised

suggestions of strategies you can employ based on your type of uncertainty. Any data collected for generation of this report is in compliance with the GDPR requirements and will be stored and processed accordingly.

## Report Sections

<b>Self-Regulated Learning Profile</b>
This section provides a detailed view of the various self-regulated learning strategies that you typically employ when faced with uncertainty.
<b>Type of Uncertainty</b>
This section will identify what type of uncertainty you are facing at the moment. It will also elaborate the different types of uncertainties, the learning strategies typically adopted by professionals during each of these uncertainties, and recommendations will be made based on your SRL and LiU profile
<b>Summary of Learning in Uncertainty (LiU) Profile</b>
This section will identify your position on the LiU matrix and give you a summary of your LiU profile.

## Self-Regulated Learning Profile



Learning Strategies	Description	Competency Level
Strategic Planning	Ability to identify a need for learning and taking purposive actions to undertake that learning	69%
Self-Efficacy	Belief in your inherent capabilities to achieving your set target	75%
Goal Setting	Ability to set learning goals and work towards achieving them. It also includes your ability to realign your goals when learning requirements have changed.	73%
Task Interest and Value	Ability to recognise the importance and value of your learning activity.	73%
Elaboration strategies	Ability to apply the learning in wider contexts	87%
Task Strategies	Range of learning strategies you employ based on the demands of your job.	92%
Critical Thinking	Ability to objectively evaluate and analyse your learning needs.	73%
Help Seeking	Ability to call upon your social networks, colleagues, experts in your area to enhance your knowledge.	60%
Self-Evaluation	Ability to identify your own strengths and weaknesses in order to develop	80%

	your skills and abilities to enhance your strengths and address your weaknesses.	
Self-Satisfaction	Sense of contentment with your learning accomplishments, that fuels your motivation to further your learning goals.	60%

**Here's how to interpret your scores:**

If your score is	Your competency in that skill is
< 40%	Poor
40% – 60 %	Moderate
60% – 80%	High
> 80%	Excellent

## Type of Uncertainty

Research shows that your feeling of uncertainty can be typically categorised into one of these types:

1. State Uncertainty – When you are unsure about what changes are happening in your work environment.
2. Effect Uncertainty – When you are unsure about how the changes will impact you.
3. Response Uncertainty – When you are unsure about how you are going to respond to the changes in your environment

Your scores show that currently you are experiencing high level of **Effect Uncertainty and moderate level of Response Uncertainty**. This means that you are highly uncertain about the impact of the changes in your work environment. You are slightly uncertain about how you will respond to these changes.

Typically, professionals experiencing these types of uncertainties resort to the following self-regulated learning strategies:

1. Networking and Help-seeking
2. Self-Reflection
3. Self-Evaluation
4. Goal Setting
5. Strategic Planning

Your SRL competency scores for these strategies are as follows:

Help Seeking	Ability to call upon your social networks, colleagues, experts in your area to enhance your knowledge.	60%
Self-Evaluation	Ability to identify your own strengths and weaknesses in order to develop your skills and abilities to enhance your strengths and address your weaknesses.	80%
Self-Satisfaction	Sense of contentment with your learning accomplishments, that fuels your motivation to further your learning goals.	60%

Goal Setting	Ability to set learning goals and work towards achieving them. It also includes your ability to realign your goals when learning requirements have changed.	73%
Strategic Planning	Ability to identify a need for learning and taking purposive actions to undertake that learning	69%

## LiU Summary

### Your total Self-Regulated Learning Score is 148.

This means you are able to effectively self-regulate your learning through planning and goal setting. When faced with uncertainty situations do not hesitate to seek help from your colleagues or superiors to understand if they have faced similar situations before, and how they have handled them. This is especially important as research shows that interpersonal communication is the key to effectively learning during uncertainty. You practice self-reflection to a certain degree as you are able to draw upon your past experiences in preparation for the uncertain future. But you could benefit from incorporating self-reflection into your daily routine as a key stage of learning occurs when you admit that you have learned something and then integrate it into your existing knowledge and work practices.

### Here's how to interpret your SRL Score:

If your score is between	That means you are
42 – 143	Low Self-regulated learner
143 – 171	Moderate Self-regulated learner
172 – 210	Highly Self-regulated learner